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A STUDY OF THE CARDIOVASCULAR INDEX IN ELEMENTARY SCHOOL CHILDREN*

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For many years we have labored to improve the health of school children by athletics, physical exercises, open air schools, expensive heating and ventilating systems, medical inspection, etc., but in all our efforts we have yet evolved no accurate, scientific measure by which to evaluate our results. It was the purpose of this study made in Clinton, Mass., on some elementary school children by Dr. James R. Kirby, the school physician, and Frederick E. Clerk, the superintendent of schools, to determine whether or not, and, if possible, to what extent, the cardiovascular index could be applied to the routine of medical inspection in public schools as a measure or index of the physical health of school children, and to observe what relation, if any, existed between the cardiovascular index (Dr. J. H. Barach, Pittsburg, Pa.1.) and the vasomotor index (Dr. C. Ward Crampton, New York City, 7).

The cardiovascular index is an accurate statement of the amount of energy expended by the heart and blood vessels in one minute. It is found by multiplying the maximum (systolic) blood pressure by the pulse rate per minute and adding the result to the product found by multiplying the minimum (diastolic) blood pressure by the pulse rate per

* This study was made in connection with the Department of Pedagogy and School Hygiene of Clark University under the direction of Professor Wm. H. Burnham.

minute. For example, if the maximum blood pressure is 120 mm. Hg. and the pulse rate 72 and the minimum blood pressure is 80 mm. Hg. the energy expended would be represented as follows:

In systole 120 mm. Hg. x 72 = 8,640 mm. Hg. per minute.
In diastole 80 mm. Hg. x 72 = 5,760 mm. Hg. per minute.
In both 200 mm. Hg. x 72 = 14,400 mm. Hg. per minute.

In presenting this very simple and practical measure of cardiovascular energy the author draws attention to the important fact that we are not deceived by a high maximum pressure when it is combined with a relatively low minimum pressure or vice versa, and also that we do not neglect to consider the pulse rate, which is an absolutely necessary element in properly estimating the expended energy of the cardiovascular system in a specified length of time.

In establishing the clinical value of this index Dr. Barach presents a list of examinations made of 289 young men between the ages of 15 and 30 years. In these cases there were 41 in which the maximum pressure ranged between 110 and 120 mm. Hg. Ordinarily, these would have been passed over without consideration, but on comparing the extremes of cardiovascular energy in this series and in subsequent ones it was found that the maximum pressure alone, on which most reliance had heretofore been placed, gave little or no conception of what was taking place in the arterial system. Subsequent studies by other investigators have verified the importance of considering both the systolic and diastolic pressures.

From the following table which represents a series of 116 normal cases in which the pulse rate did not exceed 90 beats per minute, and the minimum pressure did not exceed 100 mm. Hg., Dr. Barach concludes that the highest energy index of a normal adult would be close to 20,000 mm. Hg. per minute.

Maximum pressure mm. Hg.	Number of cases	Average total energy mm. Hg. per minute
From 100 to 120	16	15,196
From 120 to 130	59	17,086
From 130 to 140	22	17,450
From 140 to 150	12	18,722
From 150 to 160	7	20,705

Arranged on this basis the point of highest frequency would be 17,086, which may be taken as the normal for purposes of further study, although Dr. Barach says that no special attention need be given to cases whose total energy index is as much as 20,000 unless there are accompanying factors of

significance. He also says that it does not involve too great an error and certainly does greatly simplify the figures to ignore the last two digits in each total. Thus the median above would be 170, and the normal maximum would be 200.

Unquestionably Dr. Barach has evolved a simple, accurate measure of the energy being expended by the circulatory system at any given time. He has included the important triad of pulse rate, diastolic and systolic blood pressures.

Dr. Louis Warfield, in his paper in the *Archives of Internal Medicine,* entitled "Studies in Auscultatory Blood Pressure Phenomena," says: "In an elaborate critical review of the literature bearing on blood pressure, and particularly diastolic and pulse pressure, with the relation of the pulse pressure to the velocity of blood flow, they [Howell and Bush (13)] concluded that there was some relationship between the velocity of blood and the pulse pressure, which could be expressed as velocity equals pulse rate times pulse pressure." Dawson and Gorham (10) in an experimental study of the relationship of pulse pressure to systolic output, conclude that under normal conditions the pulse pressure is a reliable index of the systolic output. These statements seem to indicate that Dr. Barach is in agreement when he includes this factor in his total of energy expended in the circulatory system as he presents it in his cardiovascular index. Other recent investigators agree that all the factors should be considered together and recent clinical practice is following this procedure.

Dr. Crampton's test of vasomotor efficiency that we used for comparison, is based on observations "of the efficiency of the vasomotor system in responding to the necessity of raising the blood pressure upon rising from the recumbent to the standing position." In the perfectly normal male there will be an increase in blood pressure of from 8 to 10 millimetres upon rising from a recumbent to a standing position, due to a vaso-constriction effort which squeezes the veins and attempts to overcome the extra hydrostatic load due to the change in position. In one not in good physical condition the pressure will fail to rise and may even fall ten millimetres. The heart rate, on the other hand, varies with the change in blood pressure. "Hill states that the heart, as it were, comes to the rescue of the falling pressure by beating faster in a successful endeavor to re-establish it, its rate increasing in proportion to the necessity." Another explanation holds that the increased heart rate merely reveals the increased blood pressure, the heart finding it necessary to relieve itself of the blood that is being forced into it. Dr. Crampton observes that successive readings on a single patient show variations in heart rate and

blood pressure which compensate each other and a consideration of both would reveal no change in vasotone efficiency.

The relation of these two factors is the basis of his test, and on a statistical balancing of the two frequencies of variation, viz., the heart rate and the blood pressure, he constructed a scale which provided a convenient and intelligible method of recording and reporting observations and permitted a numerical statement of vasotone efficiency, 100 indicating a perfect working of the vasomotor system and 0 marking the point where the patient would be unable to stand erect.

This test has been tried in school hygiene to determine the amount of physical cost of school procedures of various kinds. Dr. Crampton gives the following as a typical case:

Time	Increase Pulse Rate	Increase Blood Pressure	Per Cent	Remarks
9.45 A. M.	0	10	100	Slept well. No exercise.
10.45 A. M.	0	4	85	After lesson in physics.
11.50 A. M.	8	10	95	After lesson in algebra.
12.24 P. M.	5	6	85	After lesson in French.
1.10 P. M.	6	8	90	After lunch and rest.
2.00 P. M.	14	8	80	After history lesson.
2.35 P. M.	16	4	70	After slow mile run.

"This shows that one period of work in the physics laboratory (which required continued standing) was more expensive than a slow mile run. It also showed that this was partially regained in the algebra period, lost again during the French period and partially regained by rest at the lunch period. The record also showed the importance of considering both heart rate and blood pressure."

If such determinations as are apparently revealed by the above case reported by Dr. Crampton are within the scope of the possibilities of this test in the hands of school principals, school nurses or physicians, a service of inestimable value has been rendered to the profession and to the school children.

Before proceeding to a description of the tests made in Clinton it seems wise at this point to consider some of the factors involved in blood pressure studies, particularly as applied to children. Comparative studies involving observations in blood pressure should take into account important differences in methods of taking the observations.

The literature available on this subject presents a variety of methods and a still greater variety of instruments for determining blood pressure. The large variety of instruments is divided into two general classes, the aneroid sphygmomanometers and the mercurial instruments. The methods for

determining diastolic pressure are divided into four groups: (a) by palpitating the radial pulse and noting the maximum wave felt—this is inaccurate and difficult to measure; (b) by noting the maximum oscillation of the mercury column, or in a dial instrument, the maximum fling of the needle; (c) by recording pulsations on a revolving drum and noting the point of maximum oscillation of the tambour lever (Erlanger's instrument); (d) by auscultating over the brachial artery below the cuff and noting the point where all sound disappears as the pressure is reduced. The most accurate of the above methods is Erlanger's, but it is practically valueless in school inspection work because of the inconvenience of the instrument. The best all-round instrument seems to be one of the dial variety.

More recently there have appeared several articles which have endeavored to establish definitely the best method for determining the exact diastolic pressure. It seems that this would be an exceedingly important matter in view of the fact that a difference in method for determining diastolic pressure will make a difference according to some observers as high as 16 millimetres of mercury.

Dr. Warfield(23) concludes that: 1. The auscultatory is the best, simplest and most accurate method for determining the systolic pressure. 2. Irregularities in the force of the heart beats are most easily discovered by the auscultatory blood pressure method. 3. The measurement of diastolic pressure is clearly as important as the measurement of systolic pressure. 4. The diastolic pressure is not usually at the point of disappearance of all sound. 5. He also says, referring to difference in methods of determining pressures, that Korotkoff found that by the auscultatory method the systolic pressure was from 10 to 12 millimetres higher than by the palpatory method.

Some observers have gone so far as to say that the diastolic pressure in children is practically undeterminable with the instruments available in the present state of medical science. This claim can be dismissed with the statement that only in very rare cases are the sounds characteristic of diastole indeterminable with a dial instrument and a stethoscope, and to an ear accustomed by training to the sounds the reading of the diastolic pressure presents no greater difficulties than the reading of the systolic pressure.

"In 1905 Korotkoff (15) discovered that by placing the bell of a stethoscope over the brachial artery from 1 to 2 centimetres below the cuff he could hear very characteristic sounds when the pressure was released. He noted three groups or

phases of sounds. Further observations by Ettinger, Fischer and others have shown that normally there are five so-called phases which are as follows: The first phase is a more or less sharp clear tone which corresponds to the first pulse wave to go under the cuff. The second phase is this same tone more or less clear plus a series of murmurs. The third phase is a transition to a loud, sharp, clear tone which suddenly or gradually becomes dull (fourth phase) and finally ceases altogether, no sound being heard (fifth phase)."

"It is absolutely essential that one listen as near the lower edge of the cuff as possible and directly over the brachial artery. The first sound is thought to be produced by the small amount of blood which rushed under the cuff at considerable velocity just at the point when the intra-arterial pressure is greater than the extra-arterial pressure produced by the air-bag round the arm. As the pressure is now gradually lowered there is more and more blood passing through under the cuff at every systole. As the artery below the cuff is collapsed and greater in diameter than the compressed part of the artery, eddies are set up which produce the second murmur and sound phase. The third phase is the loudest sound and is probably due to the full expansion of the artery below the cuff, the artery under the cuff and the part below the cuff becoming of equal size at every systole. As more and more blood enters, the artery below the cuff becomes more of normal size and the sound becomes dull. When there is no pressure exerted on the artery below the cuff, the whole vessel is normal in size and no sound is heard—that is the fifth phase."

"It is generally accepted that the first sound measures accurately systolic pressure. This has been proven by records that have been made with the Erlanger instruments. These five phases are not always by any means to be differentiated. The tones are dependent on three factors—strength of the heart beat, size of the artery, and elasticity of the artery. The third tone is normally the loudest. It is generally agreed that a loud, long, clear third phase indicates strength in the heart. A weak third phase shows weakness and a disappearance of this phase indicates great weakness. A strong third phase may show a powerful heart provided that the artery is not sclerosed (23)." Some observers claim that the disappearance of all sound measures the diastolic pressure. In fact this point has been universally used until recently. Erlanger proved it with an artificial circulation schema, but the apparatus designed by him for practical use is subject to a delayed reading that vitiates the results.

According to Dr. Warfield the diastolic pressure is not at the point of disappearance of all sound when the pressure is gradually reduced, but at a point corresponding to that when the first dull tone is heard following a loud sharp tone.

It is therefore concluded that the point where the diastolic pressure should be read is at the tone change from clear to dull and not at the point where all sound disappears. Dr. Warfield demonstrated this phenomenon by an experiment upon dogs. He says in man the point where diastolic pressure should be read is just at the point where the third clear tone-phase suddenly becomes a dull sound.

Drs. Judson and Nicholson (14) say (concerning the point at which the diastolic pressure is to be read): "When we use the auscultation method in children we must take the time of appearance of the dull sound (fourth phase) as the time to read the height of the mercury column, which gives the accurate diastolic pressure. If the time of disappearance of all sound (fifth phase) is taken the error varies from 11 to 20 millimeters of mercury."

In the studies made on the Clinton children the point used to record diastolic pressure was the one at the so-called fourth phase, where the tone changes from clear to dull, which corresponds with the method used by Drs. Judson and Nicholson. This was selected because it was the most accurate in practice. The dull sound following the clear tone served as an additional check on the reading, the oscillation of the needle being closely watched at the appearance of both sounds. If taken at the disappearance of all sound one is often uncertain just when he heard the last sound; and particularly with the instrument used in the Clinton studies (Tycos sphygmomanometer), the needle is dropping all the time the attempt is being made to locate the point at which the sounds ceased. Possibly with practice one method may become as accurate as another as far as technique is concerned, though the preponderance of authority is against the reading at the fifth phase.

The literature on the subject of blood pressure studies on children is very limited. Previous to the tests made by J. H. McCurdy in 1909 practically nothing was attempted outside of the strictly pathological field. One of the most important of the earlier studies is that by Uppenheimer and Vauchwitz. They made a series of careful experiments on 68 healthy children. The work included at least three observations on each child. They discovered the influence of food, drink, exercise, and nervous system on blood pressure. They conclude as follows: 1. Blood pressure rises with age.

2. After eating food, particularly rich food, the blood pressure rises. In infants the rise is not always present. 3. Foods rich in fluids raise the pressure. 4. Vigorous movement sometimes raises the pressure. Sometimes it remains on the same level. 5. Physic stimulants raise the pressure under all conditions (Ueber den Blutruck bei gesunden Kindern, *Archiv für Kinderheilkunde,* 1905, 42: pages 415 to 438).

Of the recent investigations, those by Drs. C. H. Judson and M. D. Nicholson (14) are noteworthy. They conducted a series of experiments extending over one year and a half and covering some 2,300 observations. In a large number of cases their readings were made by the auscultation method while the records were being made on a drum of a modified Erlanger apparatus, so that their observations offered an excellent means of comparison of the two methods. It seems probable that they have established a standard of blood pressure in the normal child between the ages of 3 and 15 years. The experiments were conducted with the greatest possible care and it is quite probable that their claims are justified.

They say: "Our results show that the systolic pressure is higher than that generally accepted and does not show any arithmetical increases from year to year. The total rise in systolic pressure from 4 to 14 years is represented by only 14 millimeters of mercury. In contrast to the systolic pressure the diastolic pressure remains at an almost uniform level and the pulse pressure increases progressively and proportionately more than the systolic pressure over the corresponding period."

Referring to the value of statistics on blood pressure they continue: "The figures in our tables represent the averages of a large number of readings. We do not claim that they are an absolute standard. While in the individual child the variance in the systolic pressure may be considerable, diastolic pressure remains fairly constant. The importance of determining the pulse pressure in every case cannot be too strongly emphasized. The determination of the pulse pressure, indicating, as it does, the peripheral resistance, is the most important point to be determined in children."

Judson and Nicholson also emphasize the importance of the width of the cuff or arm band of the sphygmomanometer. They quote several experiments to show that results obtained with a cuff less than 9 centimeters in width are not reliable. In their experiments they used a cuff 13 centimeters in width. this is the same width of cuff used in all the studies made on the Clinton school children.

From the foregoing statements it will be observed that there is some confusion in the literature on the subject of blood

pressure in children, but there is general agreement that a consideration of pulse rate and diastolic and systolic pressures is essential; that there is a difference in the blood pressure readings between adults and children; that the relative changes in the pulse pressure are different between adults and children; that the condition of the greater elasticity of the circulatory system in children is a controlling factor in the difference of the blood pressures, and that diastolic pressure can be determined with reliable accuracy, though the point at which the reading is made should be indicated.

In the Clinton tests the method of auscultation was used in determining the blood pressures and the diastolic pressure was read where the clear tone changed to a dull one. Previous to the examinations, many preliminary tests were made on children with the view of eliminating or minimizing the possible disturbing factors which would affect the results, such as nervousness of the patient, previous exercise, etc. The examinations were all conducted in the school physician's office, which is 200 feet distant from the class rooms from which the children were taken. One examination was made at 8:30 in the morning before the children began their school work; another was made at 11:30 immediately at the completion of the morning session; another examination was made at the beginning of the session in the afternoon at 1:30; and a fourth was made at the close of the session in the afternoon, at 3:30.

The boys were taken two at a time and the examinations were made in the presence of one another. This was done to eliminate a tendency to nervousness, which was very evident and troublesome in the preliminary studies. Even with another boy present taking the same examinations, the tendency to nervousness was not entirely eliminated; this was particularly true of the examinations in the morning; the examinations later in each day showed less effect from this factor. It was apparently not at all present in some cases, in others it was extreme. In one instance, namely, boy D, the lad fainted while his pulse was being taken at the morning examination. In the preliminary studies children were tested in their class rooms, in vacant class rooms adjoining their own class rooms, in the superintendent's office, and in the physician's office, with the idea of determining whether or not the tendency to nervousness would perhaps be less in one place than in another. Apparently the location and environment had nothing to do with this factor.

The following table presents the results of the tests for the cardiovascular index on 22 boys. The figures represent the

indexes without the two final digits as recommended by Dr. Barach:

TABLE SHOWING CHANGES IN CARDIOVASCULAR INDEX DURING AN ELEMENTARY SCHOOL DAY

	A	B	C	D	E	F	G	H	I	J	K	L
8.30 A. M.	115	153	212	180	189	180	145	221	145	188	154	167
11.30 A. M.	92	128	167	210	135	159	142	238	146	149	98	134
1.30 P. M.	131	158	180	259	170	243	169	204	127	163	142	156
3.30 P. M.	117	165	185	181	177	131	162	172	131	137	115	159

TABLE SHOWING CHANGES IN CARDIOVASCULAR INDEX DURING AN ELEMENTARY SCHOOL DAY—*Continued*

	M	N	O	P	Q	R	S	T	U	V	Median
8.30 A. M...	182	177	145	161	128	172	177	161	206	92	165
11.30 A. M...	144	157	129	139	116	155	151	171	181	100	140
1.30 P. M...	158	165	147	142	134	176	159	166	165	126	155
3.30 P. M...	141	146	143	152	136	165	130	142	159	89	145

The table above seems to indicate that the cardiovascular system is under greater labor at 8:30 A. M. than at any other time of the school day as far as children of this group are concerned, and that the lowest point of energy expenditure is at the close of the morning session. During the noon recess it seems to rise to almost the point reached at 8:30 A. M., and at 3:30 it drops to almost the point reached at noon. The drop during the morning is more than twice as great as that during the afternoon. With figures of such great variability and so few of them, little more than *possible* tendencies can be expected. It is significant, however, that only five cases of the 22 showed an increase during the day.

A large number of cases tested by this index would give information that promises to prove of great value. If the tendency observed at Clinton should prove to be universal, then our views as to the unhygienic life of the school room may have to be revised; for, apparently, the children tested in Clinton show less expenditure of cardiovascular energy to sustain life at the end of the school day than at the beginning.

The Clinton tests give evidence of a reliable nature which

seems to prove that the estimate of the normal index for adults is not a normal index for children. Proceeding on the same basis to find the normal index for children as that adopted by Dr. Barach in finding the normal index for adults, we get the following table in which it is observed that 17,760 is the highest normal index, and the point of highest frequency is 15,123.

Maximum pressure mm. Hg.	Number of cases	Average total energy mm. Hg. per minute
From 80 to 90	7	11,211
From 90 to 100	20	13,268
From 100 to 110	22	15,123
From 110 to 120	12	16,634
From 120 to 130	1	17,760

This seems to argue strongly that a lower range of values of cardiovascular energy is to be expected in children as compared with adults. The method of determining the averages indicates that the difference is due to a lower range in blood pressures. The median point in the above scale for children is the minimum point in Dr. Barach's scale for adults, and the median point in Dr. Barach's scale for adults is the maximum point for the above scale for children. The normal maximum blood pressures for children seem to vary between 80 and 130 and for adults between 100 and 160. For adults Dr. Barach gives 20,000 as the normal maximum cardiovascular index as compared with the above 17,760 for children, and a median of 17,086 for adults as compared with the above 15,123 for children.

Using the data collected by Dr. J. H. McCurdy in his studies on changes in blood pressure during adolescence in which he records the pulse rate and systolic and diastolic blood pressures, and from these data computing the cardiovascular index, a very significant comparison is possible with the observations made on the Clinton school children.

	Average systolic blood pressure	Average diastolic blood pressure	Average pulse	Average cardiovascular index
J. H. McCurdy.....	104	67*	85	14,535
J. R. Kirby & F. E. Clerk	104	81*	84	15,540

* The difference in minimum pressure averages is accounted for by the fact that Dr. McCurdy used the method of obliteration in determining the minimum pressure, while in the tests of Dr. Kirby and Mr. Clerk the method of auscultation was used.

At the same time the tests of the cardiovascular index were being made the data were gathered from which the vasomotor indexes were computed to determine whether or not these indexes revealed any relation between vasomotor tone and the expenditure of cardiovascular energy

The table below presents the vasomotor indexes for the different periods of the day as indicated by the examinations of 22 boys.

TABLE SHOWING THE CHANGES IN THE VASOMOTOR INDEX DURING AN ELEMENTARY SCHOOL DAY

	A	B	C	D	E	F	G	H	I	J	K	L
8.30 A. M.	65	40	65	70	65	50	50	55	60	75	50	65
11.30 A. M.	65	50	65	75	60	95	65	80	70	60	55	55
1.30 P. M.	50	30	65	75	70	60	50	75	80	75	60	50
3.30 P. M.	45	35	55	65	80	95	75	65	80	75	60	35

TABLE SHOWING THE CHANGES IN THE VASOMOTOR INDEX DURING AN ELEMENTARY SCHOOL DAY—*Continued*

	M	N	O	P	Q	R	S	T	U	V	Median
8.30 A. M...	50	90	70	55	65	50	70	65	25	5	60
11.30 A. M...	65	75	75	60	45	70	70	85	50	5	65
1.30 P. M...	35	60	40	45	65	50	50	70	25	10	55
3.30 P. M...	40	70	65	50	50	50	40	60	35	10	60

Little that is reliable can be gathered from statistics as few and variable as these. The medians for the various examinations, however, suggest a tendency worthy of further test on a larger number of pupils. One of the most obvious features of the results of the tests in vasomotor tone is the variability in the same individual and the variations among different individuals. This may be explained possibly by the fact that the blood pressure factors in prepubescent and pubescent children show great variations. Dr. J. H. McCurdy has shown that of the three groups, pubescent children show the highest blood pressure, post-pubescent children the next highest, and prepubescent the lowest. In view of the fact that the boys examined in these tests were all either prepubescent or pubescent, we may reasonably expect these variations. So

great is this variability that one is apt to question a test in which variations are so common that, because of their frequency, the significance of the variation from the normal is obscured. A similar test made of boys grouped according to degrees of pubescence would probably be more reliable. The boys tested were apparently all in equally good health, yet in one of the examinations, viz., boy V, we find a combination of an increase of 13 in pulse rate and decrease of 27 in blood pressure on coming to a standing from a recumbent position which, according to Dr. Crampton's scale, would make his condition as to vasomotor efficiency —5, and he theoretically would be unable to stand erect. He was in as good health as the other boys, as far as could be judged by Dr. Kirby, and until the close of school in June, 1915 (a period of three months), continued in apparent good health.

Another factor which seems to present difficulties of interpretation is the low median indicated by these tests. It seems hardly justifiable that apparently normal, healthy boys should show such a low vasomotor tone if vasomotor tone is a reliable index of physical health. This seems to be explained by the probability that the natural elasticity of the youthful arteries is enough to take care of the extra hydrostatic load occasioned by coming to a standing from a recumbent position, and no extra demand is necessary on the part of the vaso-constrictors.

The assumption that the vaso-constriction effort in the arteries of prepubescent children is not present or co-responsive to the influence of the effect of the extra hydrostatic load occasioned in the blood vessels on coming to a standing from a reclining position is apparently supported by the tests made by Dr. J. H. McCurdy (16) during his investigations on the changes in blood pressure during adolescence. Taking the

TABLE

	Average pulse reclining	Average pulse standing	Difference	Average systolic blood pressure reclining	Average systolic blood pressure standing	Difference	Average vasomotor index
J. R. Kirby and F. E. Clerk.....	74	84	+10	105	104	—1	62
J. H. McCurdy.....	76	85	+ 9	103	104	+1	67

data on blood pressures and pulse rates standing and reclining, gathered by him through observations on 200 boys, and from this data computing the vasomotor tone according to Dr. Crampton's Table and comparing the averages with those of these data computing the vasomotor tone according to Dr. results, particularly when we consider the variable nature of the factors involved.

The evidence of the above figures seems to indicate the probability that another set of values in Dr. Crampton's table is necessary in order to make it applicable to prepubescent children, or if the same values are to be used they must be interpreted differently than when applied to post-pubescents. The tests, however, give evident promise of great value in determining the vasomotor efficiency of children in general terms, but there is reasonable question of their value in measuring the fatigue occasioned by the various factors of school work upon different types of school children in terms of dependable exactness.

Owing to the many factors that influence blood pressure, any studies offered as a standard for further observations should be based on a series of tests on the same pupils. This has been done in most of the literature on the pathological studies of blood pressure, but is yet to be attempted in a comprehensive way to its hygienic aspects as applied to school children. Dr. McCurdy's work in this field is important. He is in agreement with Dr. Crampton in so far as he says that a fluctuation in pressure on changing from a horizontal to a standing position probably means lack of cardiovascular adjustment (vasomotor tone). But upon examination of Dr. McCurdy's determinations it would appear that out of 28 prepubescent children, 16 showed an increase in blood pressure on changing from a horizontal to a standing position, 10 showed a decrease, and in 2 the pressure remained the same. In the experiments recorded in Clinton, out of 88 determinations 21 showed an increase, 12 remained the same, and 55 showed a decrease. It does not seem reasonable that so large a percentage of children apparently normal in other respects should show a low vasomotor tone. As Drs. Judson and Nicholson have stated: "The relatively larger, more elastic and distensible arterioles and capillaries found in children make the peripheral resistance less marked than in adults, and the vessel-walls are in a less stable state of equilibrium," and as Dr. Kirby observes, as a result of the Clinton studies, it is apparently reasonable to expect that in children a falling in blood pressure upon resuming a standing from a reclining position is not significant unless it is a marked decrease.

The attempt to use tests of the character reported here in

the ordinary routine of medical inspection in public schools may not, at least at first, be productive of reliable statistical results, but the very attempt to measure the energy factors of school children will produce some very valuable results of a clinical rather than a hygienic value that justify their practice. I will outline one instance that came to our attention in the Clinton studies which will indicate the possibility of revealing cases that would otherwise never have their real nature discovered.

On December 4, 1914, Thomas F——— was sent to the office of the superintendent of schools with a note from the principal of the building in which he attended fourth grade, saying that neither his teacher nor the principal could make any impression on him; that he was an unruly child and a source of so much annoyance, that he would have to be dropped from the school. The boy showed none of the traits of an inherently bad boy, but did show indications of hypersensitivity. It occurred to the superintendent that he would be a good subject upon which to determine the cardiovascular index. He was given both the tests for the vasomotor and cardiovascular indexes, in both of which he showed a result far below normal. In the latter test his systolic blood pressure was 145 and his pulse 120. This information alone was of sufficient importance to justify the physician in looking for serious pathological conditions. The lad's history was looked up, and it was learned that he was born under abnormal conditions, and that recently he had had all of his upper teeth extracted because they had rotted to the gums and his digestive tract was being fed on the pus that was washed into it with his food, causing a severe digestive disturbance and toxemic condition. The teeth had been extracted by the order of the school physician, and his condition had much improved after a convalescence of one month. It was one month after his convalescence that he was sent to the superintendent as an unruly child. Upon further examination it was revealed that the boy was suffering from an exaggerated form of hypernervousness, and it was recommended that he remain out of school for one month, reporting weekly for examination. After the second week his condition showed improvement. After the fourth week his examination resulted as follows:

	Pulse	Blood pressure	
Horizontal	95	120	Vasomotor Index 68
Vertical	98	135	

Maximum blood pressure	135	Cardiovascular Index 23206
Minimum blood pressure	112	
Pulse	98	

These results show him to have reached an almost normal condition. He is now attending school mornings only, and is doing well both as to conduct and studies. The process of finding his cardiovascular index revealed the real nature of his school difficulties and served as a means of evaluating his later improvement. If the cardiovascular index had no other value than the revelation and subsequent treatment of so-called "border line health cases" its existence and use would probably be justified.

Technique. The tycos sphygmomanometer was used and tested at intervals. The cuff or arm band of the sphygmomanometer was 13 cm. in width. The boy was asked to rest for five minutes lying on a couch supine with no pillow. The sphygmomanometer was then adjusted over the brachial artery of his left arm, the arm resting on the couch. A flat rubber band was found useful in holding the bell of the stethoscope over the artery. This allowed the observer to keep the tubes of the stethoscope from rubbing together, thereby eliminating many disconcerting sounds which interfered with the pulse sounds. In rolling up the sleeves of the patient in order to bare the arm for the application of the cuff of the sphygmomanometer, care was taken that the sleeve was not tightened under the arm, which would interfere with the brachial artery. After the sphygmomanometer had been adjusted his pulse was taken by quarter minutes until four successive quarters read the same. The systolic pressure was then taken by the auscultation method and three readings noted until three that were the same, or practically the same, had been recorded. Where they were not exactly the same, the average of the readings was recorded. The patient was then asked to stand and the heart rate was counted until it reached the standing normal; that is to say, until it reached four successive quarter minutes of the same reading. Then the systolic and diastolic pressures were taken, successive readings being made until three alike, or approximately alike, had been observed. The average was used where the three readings were not exact. The blood pressure standing was taken with the sphygmomanometer at the level of the heart over the brachial artery, the patient resting his arm on the arm of the observer.

During the entire tests care was taken to eliminate effects upon the reading such as would be caused by the act of thinking, changing of position, nervousness, unusual noises like the slamming of a door or the ringing of a bell, remarks between observers commenting upon the reading, etc.

The following other facts were recorded, namely: the age of the patient, height, weight, health, sex, nationality, grade,

scholarship, deportment, effort, hours of sleep night previous to examination, number of windows open in sleeping room, time of breakfast on the day of examination, contents of breakfast, and the same concerning dinner. Record was also made of the boy's activities before school and after. No conclusions were attempted from the results of these other facts as the number of pupils examined was too small and the individual variations too great to make a significant classification possible.

Conclusions. 1. In the hands of a physician, tests of both the vasomotor and cardiovascular indexes are of undoubted clinical value and give promise of service in public school hygiene.

2. The wide range of individual variations and the lack of adequate reliable standards indicate that tests of this character are as yet of little hygienic value in the hands of other than trained observers when applied to elementary school children.

3. The cardiovascular index is a simple, accurate measure of the energy expended by the circulatory system; but in the case of elementary school children, the normal seems to be less than that for adults or post-pubescent children. It is probably between 14,500 and 15,000 for prepubescent children.

4. The vasomotor index, as far as these tests show, seems to produce uncertain results on the basis of the table of relative values used in applying this test to older children or adults. A new set of values based on a smaller factor of variations in blood pressure seems to be necessary.

5. The figures presented by these tests show no statistical correlation between the two indexes, though the meager amount of data and the extreme range and frequency of the variations hardly entitle this result to more than passing consideration.

6. The indirect results of applying the cardiovascular index, its simplicity, and its promise of future hygienic value justify the conclusion that a record of the cardiovascular index of each public school child should be made a part of the routine medical inspection and that frequent tests should be made of the "border line health cases."

7. According to our experiments 17 children were using less cardiovascular energy at the end of the day to sustain life than at the beginning, while 4 showed a slight increase. This result justifies further investigation.

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STAMMERING AND ITS EXTIRPATION

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The Difference Between Stuttering and Stammering.—In the English language, as the words are generally used, stuttering is habitual repetition and stammering is spasmodic abortive speech. However, stammerers sometimes resort to stuttering before a feared word. The distinguishing difference between stuttering and stammering is that stuttering is under the control of the will and stammering is not, except to decline to indulge in it. Stuttering is found almost exclusively in children soon after they have learned to talk, although some adults stutter slightly through carelessness in speech. Uncorrected stuttering soon develops into stammering. In the transition stage the stuttering is still noticeable, but it soon disappears, and the disorder becomes wholly uncontrollable, except to desist from it.

Some American speech specialists have confused the meaning of the words "stuttering" and "stammering" by using them somewhat in the sense of the German words *Stammelen*, baby talk, and *Stottern*, stammering.

The Stammerer Can Say What He Thinks He Cannot Say.—Some years ago I was on a horse car in Troy, N. Y., going toward Albia, and the car stopped at the switch near the junction of Congress and Ferry Streets. While we waited for the other car to pass us, the conductor called to a four-year-old boy on the stoop of Nagengast's store, "Who gave you a penny yesterday?" The boy replied, "Ma, ma, ma, ma, ma, *Ma.*" The marked emphasis on the last syllable was accompanied by a shake of the head as if to shake the syllable out.

Before I comment on this incident, I want to call to the reader's attention the importance of the incident itself, and the importance of drawing only correct conclusions from it. The incident involves stammering on a word in which both syllables are alike, by a stammerer in his natural environment, in the presence of numerous witnesses, and of an observer familiar with stammering. It is evident that such a combination of circumstances can occur only rarely. If

the combination was of frequent occurrence the cause of stammering would probably have been discovered long ago.

Was the child really a stammerer? Yes. The audible and visible emphasis on the last syllable is the spasm that characterizes stammering. If the child had failed to utter the last syllable or had failed to say all of it, the evidence that he was a stammerer would have been indisputable; but complete failure to say a syllable is not necessary for stammering, so to dispute that this was stammering would be only to stand on an untenable technicality.

Granting then that this child was a stammerer, we see without any assumptions:—

1. He said what he wanted to say when he had uttered two syllables.

2. He thought that he could not say what he wanted to say, or he would have discontinued after he had said two syllables.

Therefore, since 1. cannot be disputed, the thought that he could not say what he wanted to say was erroneous. In other words, he could say what he wanted to say at the time he thought he could not say it. It is well known that the stammerer can say on some occasions what he fails to say on other occasions; but I believe it has never before been proved definitely that a stammerer can at the same time say what he thinks he cannot say.

Further analysis of the case results in the same conclusion; but we have to make an assumption, namely, that the child thought that he could not say the second syllable of the word, so he repeated the first syllable until he had the courage to try the second, and then "jumped" at that in order to force it out. I think that no one who is familiar with stammering will question this assumption.

This shows that the child was actually saying "ma" all the time he thought he could not say it. Moreover, it is evident to any careful observer of stammering that if the child had used slightly more force on the last syllable, he would have failed to completely utter that; so the child would have been in the anomalous condition of actually saying what he actually failed to say. The inevitable conclusion, viewed from any angle, is, that the ability to say what he desired to say was constantly present, and that the idea of inability was totally erroneous.

The instance given is valuable as showing the origin of stammering. The child had acquired the habit of stuttering; ridicule was prompting him to make a conscious effort to speak correctly; and this conscious effort, conflicting with

his normal speech, was making a stammerer of him. The beginning of his reply was stuttering, since it was repetition without effort; the ridicule was evident; and the stammering effort on the last syllable was both audible and visible. In my opinion, accurate observation will show that a large proportion of the stammerers start as stutterers. Stuttering is known to be a common habit among children; and the habit may become so fixed that the child will make a conscious effort to correct it instead of merely talking slowly. The failure to recognize stuttering as a cause of stammering is perfectly natural. The public has no definite idea of the difference, so it would consider that stammering began when the child started to stutter, and would look for another cause. The speech specialist, who is practically the only statistician of stammering, and not always a perfectly impartial one, asks the parent how the child became a stammerer. The parent has no definite explanation; so the specialist suggests the causes that he knows of—a blow on the head, a fright, an illness. Certainly the child has had something included in the list, so the parent concludes that the event of this description, which happened not long before the stammering was noticed, must have been the cause of the stammering, and the conclusion goes to build up the statistics of the subject.

Summary.—The stammerer is always able to talk. Stuttering is a cause, and probably an important cause, of stammering. Ridicule of stutterers makes stammerers of them.

Stammering Is a Conscious Effort at Speech.—Normal speech is automatic. No one knows how he speaks. Let anyone who questions that sit down and write out just what muscles are used and the exact sequence of their use in saying the word California. He will soon convince himself that he does not know how he talks. But since he does talk, and since he does not know how he talks, then he does not talk consciously, but must talk automatically.

Now it has been shown that the stammerer can say what he fears he cannot say. Also, it is recognized that he makes an effort to talk. But since he does not know how he talks the effort conflicts with his normal automatic speech, and he stammers. In other words, stammering is a conflict between normal speech and a conscious effort misdirected through ignorance of its proper direction.

The proof of the cause of stammering may be deduced from the known facts by pure reason, as follows:—

1. The stammerer's normal speech is automatic, so
2. He does not know how he speaks.

3. When he wills to speak, automatic speech begins, but
4. He makes a conscious effort at the same time, therefore,
5. The conscious effort *must* conflict with the automatic speech.

Although this proof shows that stammering must result from a conscious effort at speech, there may be some who will say that another cause is possible. Let us assume some other cause and see what the assumption leads us to. This cause must appear and disappear synchronously with stammering. But the changes from normal to abnormal speech are so rapid and hitherto unexplainable that not even one cause could be found that met the conditions, whereas we are now in the position of supplying two. Moreover, even the assumption of any particular cause was the result of a need of an explanation, whereas we now have a perfectly valid explanation. Therefore the assumed cause is an absurdity. Consequently there can be no other explanation of stammering than collision between normal and conscious speech.

Although the conclusion that stammering is a conscious effort at speech was reached through consideration of the "mama" incident, the reader should not think that it is based wholly or even considerably on that. I have tested the conclusion with every means at my command, and have never found it wanting; on the contrary, I have never found any other explanation that was not wanting. The deficiency of all other explanations of which I have ever heard, and the sufficiency of this one, appear to make it dependable. However, I will add some contributory evidence from recognized authorities.

Dr. Scripture says:—"The habit stage is often initiated by shock or exhaustion. The person finds himself making inaccurate movements and speaking a word or words indistinctly. On account of the excessive nervous irritability in these conditions, he feels that he cannot permit himself to speak in an improper fashion, *so he instinctively tries to correct the inaccurate movements by an extra effort* at distinctness. Such an effort produces excessive muscular tension . . . . This in turn impresses itself on the memory, so that when he again makes the same sounds, he naturally makes excessive muscular movements."

Excepting the conclusion, these words are almost the exact ones in which I explained the origin of stammering long before I ever heard of Dr. Scripture or of this quotation. My explanation is as follows: The child, through an accident or incident, suffers a temporary speech disturbance and makes a conscious effort to overcome that disturbance—

now notice the difference in the two explanations—but the conscious effort is *opposed* to normal speech instead of added to it. The incompleteness of Dr. Scripture's explanation is shown by the absence of a cause for speech stoppage; he merely accounts for excessive movement, whereas the opposition of movement, resulting in stoppage, is accounted for by my explanation.

Dr. Scripture says further: "Many a one will say that if he could only forget that he had stuttered he would never stutter again." (It should be noted that Dr. Scripture uses the word "stutter" with the meaning of the English word "stammer.") The explanation is that forgetfulness of the habit would eliminate the conscious effort, and normal speech would assert itself. He says again: "If the question is asked of a patient in the fright stage 'Why do you stutter,' he will answer, 'Because I am afraid that I will stutter.'" The fright induces the conscious effort at speech, which blocks the automatic speech and causes stammering.

Dr. Albert Liebmann, speaking to the stammerer, says: "*Mit der mechanischen Sprache habe ich positiv nichts zu thun, ich muss nur den Sprachapparat gewähren lassen, damit er nach seinen immanenten Gesetzen arbeiten kann.*" A translation of which is: I have nothing to do with my automatic speech; I must leave my speech organs free to operate according to their own inherent laws.

This is evidence that stammering is a conscious effort at speech, for we know that the stammerer makes the conscious effort and stammers, whereas Dr. Liebmann says he will talk freely if he does not interfere with his automatic speech. Dr. Liebmann is the one man of whom I know who is working consistently on the right principle.

Dr. Chervin's justly celebrated triad of stammering is:—

1. Begins in childhood.
2. Absent in singing and solitude.
3. Intermittent.

The singing question will be discussed later. Taking up the other questions, we find as follows:—1. Since stammering is a conscious effort at speech, it canot occur before the child has learned to talk, as items 2 and 3 show. After the child has learned to talk, faulty speech occurs from the habit of repeating words—simple stuttering—from imitating stutterers or stammerers, from fright or from illness. The latter cases are explained as follows: When the child is recovering from the fright or illness, control of the will returns before control of the speech organs, and the child, noticing its deficiency, makes a conscious effort to speak;

but this effort, being misdirected, is a stammer, so the child believes it cannot talk properly. Once this false belief is instilled in the child, it will stammer; for it will make the conscious effort to overcome the difficulty.

Consider the absence of stammering in solitude, the last part of the second item of the triad. This is explainable on the grounds that since the stammerer is his own exclusive auditor, and since he knows his thoughts, there is no need of speaking them; so no effort is made if they are spoken. Speech specialists recognize that it is easy for the stammerer to say what his auditor already knows. Dr. Bryant points out the frequent occurrence in which the stammerer cannot say his name until after he has given his auditor his card.

Item 3 of the triad states the fact that, under apparently the same circumstances, the stammerer will stammer and then say the word without stammering. The explanation is that the stammerer will stammer when his speech is uppermost in his mind, because he will make a conscious effort to talk, but he will not stammer when he is distracted from his speech, for then normal speech will assert itself.

Denhart, after showing how fear paralyses action says: " Supported by the analogies mentioned, we can safely state that no objection may be feared to the theory already promulgated,—that stammering is a psychosis having its origin in some more or less casual incident in the history of the patient. This psychosis is based upon a delusion, an absolutely unfounded belief that there exists an impediment to the free use of speech. This delusion wreaks havoc with the different innervations requisite for oral speech. Neither the expression 'fear' (*Schranck*) nor the term 'doubt' (*Wyneken*) is applicable to this delusion, for when the delusion arises there is no doubt, but subjective certainty; that this certainty is not always accompanied by such feelings of malaise (*Unlustgefühle*) as would justify one in speaking of 'lalophobia' or 'speech fear'. These feelings of malaise are secondary, being induced by the delusion,—which naturally enough gives rise to painful experiences. One might regard stammering as one of the manifold forms of hypochondria if the symptoms of the latter affection were delusions concerning bodily disabilities, rather than 'fear and anxiety for the body itself.' Should the revived memory picture possess sufficient clearness and intensity to awaken feelings of anxiety and fear, and should its fatal influence not be neutralized by reason or by an unwavering faith in one's own faculties, then there steps in for a second time bewilderment and delay to wreak havoc with the movements that should give oral

expression to thought. The incident will be repeated, and with every repetition the disturbances find an easier victory. The anxiety rising from the recollection has shown itself to be well founded. Any dubiety as to its foundation, which might at first have appeared, is silenced by the seemingly incontrovertible evidence of fact. Forthwith there disappears anxiety—care lest there should recur those unhappy disturbances with which the malady began—and in its stead there prevails the subjective certainty that the stammerer no longer has unimpeded use of speech. Thus there is established the delusional belief that any attempt to speak is frustrated by an actual impediment; though this impediment has in truth no existence outside the imagination of the now fully developed stammerer. This belief, with the concomitant feelings of malaise (at times weaker and at times stronger) is thenceforth the invariable cause of stammering." (Quoted from Bluemel.) I had never heard of this explanation until I saw it in Bluemel's book on March 2, 1915. After one wonders at Denhart's foresight, the next wonder is that such a wealth of truth as is in these remarks should have been left dormant instead of used to emancipate the stammerers. However, the description is faulty in considering the original disability a delusion instead of a fact, in considering the impediment a delusion, and in lack of an explanation of the manner in which havoc is wrought with the movements that should give oral expression to thought. That the original disability which caused the conviction of disability is not a delusion is readily seen from consideration of the circumstances. Take the case in which a child has acquired the habit of repeating words, that is to say, stuttering. This is a simple habit, as is proved by the fact that admonition to talk slowly will stop it. This simple habit stage may run for weeks. Since the parents do not notice it, naturally the child does not, until ridicule brings it to notice so forcibly that a conscious effort is made to overcome it. The child suddenly finds that its speech is sufficiently peculiar to cause strangers to laugh at it. How then can it be said that the child is suffering under a delusion of inability to talk? Such a claim is utterly groundless. It could only be made on the circumlocution that the child should have realized that it was stuttering, and that this could be corrected by deliberation. And to expect such maturity in the child is to exhibit infantility.

The same conclusion holds for the cases in which stammering is induced by shock, fright or illness. The broken speech of persons recovering from severe nervous stress is too much of a fact to be called a delusion.

Bluemel quotes the following incident: " H. Schmidt recalls a case in which a hussar was kicked by a horse on the left side of the forehead, and suffered as a consequence from aphasia, deafness in the left ear, and paralysis of the right arm. Gradually the aphasia disappeared and stammering took its place. After four weeks his full vocabulary returned, but the stammering persisted." Bluemel adds: " Many such cases are on record in which stammering has begun as aphasia." The explanation is that the recovering invalid, noticing an actual disability in his speech, makes a conscious effort at speech and adds stammering to the original disability, which latter gradually disappears but leaves the stammering in its place.

Denhart says of the stammering subsequent to the beginning: " Thus there is established the delusional belief that any attempt to speak is frustrated by an actual impediment. . . ." This is not a delusion; speech is impeded by a force which is just as much a fact as the force with which one locomotive collides with another; the muscular effort of automatic speech collides with the misdirected muscular effort of conscious speech. Although Denhart failed to observe the opposition of the musuclar effort, he did recognize some opposition, for he says: "An examination of the mental processes during stammering shows that the disturbance takes the form of a struggle between two opposing forces,—the will, which endeavors to translate the thought into spoken words, and the belief in one's inability to accomplish what is intended." In other words, Denhart transposes the struggle from the muscles of speech to the mental speech processes. Suppose that the mental struggle resulted in a deadlock. Then no muscular effort would have occurred. But stammering is always characterized by a muscular effort. So Denhart shows by this last quoted statement that he not only failed to recognize the true explanation of stammering, but he failed to recognize its most characteristic manifestation, namely, abortive muscular effort. This alleged contest in the mind helps to the interpretation of the statements, ". . . wrecks havoc with the different innervations requisite for oral speech," and ". . . wreak havoc with the movements that should give oral expression to thought." The meaning is the old *lack* of co-ordination, but no such lack will explain stammering. Its phenomena show, especially by their rapid changes, that normal speech must be ready always, and that the impediment must be a surplusage, not a lack. The surplusage is the misdirected conscious effort.

Why the Stammerer Has No Difficulty in Singing.—The fact that the stammerer can sing what he thinks he cannot say, indicates the presence of one or more features in singing which obviate stammering. Bearing in mind that stammering is a conscious effort at speech, let us see if we can discover what there is in singing and not in talking which avoids this conscious effort.

1. Intonation would not seem to have any advantage. The stammerer talks best in the low registers, but singing includes the whole register, so altogether it seems to offer no advantage in that regard.

2. Measure appears to have some advantage in overcoming stammering, as the almost universal practice of time-beating to cure stammering seems to show; the greater part of the advantage is undoubtedly distraction, but it would be unwise to deny any efficacy to the time-beat until proof is available.

3. Gradual start. This certainly tends to allay stammering, for it discourages the convulsive actions which are characteristic of stammering.

4. Continuity of sound. This also decreases the danger of stammering, for the start is always the most difficult for the stammerer, and continuity reduces the number of starts to a minimum.

5. The accented vowel. This is also a discourager of stammering. The vowel is the base of speech, just as the foundation is the base of the house. It is simpler to produce the vowel than the articulated word, just as it is simpler to lay the foundation than to build the whole house. The nearer the stammerer stays to the vowels the less likely he is to stammer.

Evidently, the gradual start, the accented vowel, and the continuity of sound are the important features of singing which obviate stammering. Probably the measure also contributes.

Why Fatigue Makes Stammering Worse.—Since stammering is a conflict between automatic and conscious speech, and since the conscious speech is more thoroughly under the control of the will, automatic speech gives way before the determined efforts to talk. Moreover, the thoughts of the tired individual revert to his troubles, and especially to his physical ailments. Consequently the stammerer will think of his impediment more when he is tired than when he is not, and this self-consciousness will increase his speech difficulty.

Why Consonants At the End of a Word Never Occasion Difficulty.—I have copied that question, but would like to restate it: Why do final consonants apparently never cause difficulty? The observation of stammering phenomena has not reached such a stage of perfection that we are in a safe position to say that stammering never occurs on a particular combination. We are in a much safer position when we select some combination on which stammering has been observed to occur and reason from that, than when we reason from something which we have not known to happen, but which might have happened. However, everyone conversant with the subject will admit that stammering on a final consonant is very rare. The explanation is that by the time the stammerer is near the final consonant he is talking normally, and having said most of the word, he cannot reasonably fear to say the last of it. So he simply leaves his normal speech undisturbed, and it finishes as well as it would have begun if he had not interfered in the beginning.

Why the Stammerer Can Usually Repeat Fluently the Words that Are Pronounced for Him by Another Person by Way of Assistance.—Suppose the words had not been pronounced for him. Then he would be burdened by a sense of the responsibility concerning the information to be imparted, and fear of inability to impart it would prompt him to make a conscious effort to speak, and he would stammer. The absence of that responsibility would, of course, make him less interested in what he had to say, so that he would say it more readily. The condition is similar to that in which a stammerer, failing to say his name, starts to write it and then says it before he has quite finished writing it. Before I knew what mussels looked like, I one day passed a fish market in the company of a stammering companion, and asked him what they were. He hesitated, then flexed his arm, pointed to his biceps muscle, and said "mussels." The idea was that after I knew what he wanted to say he could say it. This is only one of the tantalizing features of stammering, failure to say a thing until there is no need of saying it, and then ability.

Why the Stammerer Speaks Fluently in Concert with Other People.—Stammering is induced by fear of inability to talk. This fear prompts the conscious effort which blocks normal speech. Therefore if the stammerer does not fear that he cannot talk he will not make the conscious effort at speech, his normal speech will assert itself, and he will talk. No

fear assails him when he talks in concert, because he knows that his voice will not be missed even if he does stammer.

The Stammering Cure.—The divergent opinions regarding the efficacy of stammering cures are one of the sure indications of the inefficacy of practically the whole lot of them. But another indication is the pessimistic utterances of those who know and who are honest enough to tell the truth. Whether we accept Bluemel's report of an investigation showing possibly 2% of cures by the schools, or Dr. Makuen's opinion of possible 10%, the figures are sufficiently low to justify the general impression that it is incurable. Someone may say that 10% of cures would make such a conclusion impossible; and so it would, if one-tenth of the stammerers could count that they would be the ones to be cured. But the cures cannot be foretold. Any one stammerer might be among the lucky tenth, but we can have no assurance of it. This is an illuminating fact, for it shows that the cures are accidental. Nearly every cured stammerer is sure that he knows what cured him until he tries that knowledge on others and finds that it does not work, except in so few cases that they are negligible.

But there is one grand, infallible cure. And whose would it be but Mother Nature's? Would she close the cut or join the broken bone and refuse to correct the halting speech? She is not so partial. She stands and has stood since man learned to talk, proffering, urging her remedy; and curing all who took it. But man in his blindness has apparently never seen this great work. He has been too busy at his task of devising futile remedies of his own. What cures he has made have resulted because they happened to contain some portion of Mother Nature's principle. Who does not recall a stammering youth who is now a fluent man? I know an elderly pharmacist who is as fluent as any man, yet some years ago he was prompted by my defective speech to tell me of his difficulties with stammering. He said that he had outgrown it entirely, except that when he was very tired he noticed a tendency to recurrence.

I know another man in his prime who told me to my great surprise that he stammered. I could hardly believe him, for I had been with him much and had not noticed any peculiarity of speech. He explained, however, that he had stammered as a boy, but had so far outgrown it that he feared only two words. One word was not in common use, and the other was the name of a railroad station on a route which he occasionally traveled. When he was going to stop there, he always told the conductor to take out mileage to

the next station beyond, to avoid the necessity of speaking the name of his destination. The improvement in my own speech during one part of my life was so gratifying that I counted on a cure within a few years, until a relapse set in that put me back to hopelessness.

I recall now having been told often by people who heard me stammer that they had stammered once but that the trouble had disappeared. At that time I did not think that their recovery really constituted a cure, although a long one; so I did not pay sufficient attention to record or remember the names of the persons, much less to inquire for the explanation of their recovery. However, we now have the explanation of all such cures, although the personal experiences would have been valuable for confirmation.

Let us forget for the time being that we know what stammering is. Some readers may not accept the statement that stammering is a conscious effort at speech clashing with the normal speech, and it would not be fair to exclude those persons from the discussion of the cure because of their difference of opinion. We will start on the common ground of the past that fright causes stammering. For our further information call in Chervin's triad again.

1. Begins in childhood.
2. Absent in singing and solitude.
3. Intermittent.

From the third item of the triad we see that the stammerer does some correct talking as well as some stammering. Suppose he stammered only once a year. Before the year was over he would forget to be frightened, and then normal speech would assert itself, and he would be cured. This is an extreme case; but it shows the principle, namely the prevalence of correct speech over incorrect speech. When the correct speech builds up more confidence than the incorrect speech knocks down the stammering will decrease, and if the process is continued long enough, free speech will entirely assert itself.

I do not know how this principle was brought to the deliverance of the pharmacist; but I do know that my friend who stammered on only two words had been a traveling man for years; and in my own case the period of marked improvement began when I started writing anything I feared to say, and the progress was greatest when I also traveled as a salesman of knitting machinery and did much talking. To the natural question which a non-stammerer will ask, " How could you talk? " I will answer that my chief difficulty was with the introduction, but I got around that by using a card,

or by writing what I wanted to say. Greetings and the weather were the next topics, and they did not trouble me much. The weather is so easy for the stammerers that it is a wonder that they have not long ago worn it out. Real business was more difficult, but by that time I was beginning to feel at home, so I generally explained that I stammered, and would need more time than usual. The time was always granted, so I managed to get along by dint of frequent word substitution. Quotations were a bugbear to me, but they should always be made in writing, and of course I was glad that they should, for that relieved me of the feeling that I ought to try to say them. By such management I got along with increasing smoothness. Moreover, I made it a practice to talk to my side partner on the train, if he was disposed to talk. I avoided difficult words in such conversations and managed to get much free talking with but very little stammering. That answers the question of my ability to talk. Regarding the improvement of my friend, it seems that his exercise in comparatively free speech during his traveling must have been the main feature in his cure. As to my improvement, it is certain that the considerable amount of unembarrassed talking that I did and the writing of difficult words, both contributed to my improvement; for when I ceased traveling and went into an office where I had little talking to do, and practically all of that under embarrassing conditions, my speech rapidly deteriorated.

So both theory and practice show that the prevalence of correct talking over incorrect talking will cure stammering. Moreover, a little consideration will show that no other cure is possible. Memory is the connecting link in stammering; its retention of the last trouble prompts the effort which causes the next trouble, and so the chain of trouble is forged. Memory can be subdued for a time. It can be made subservient to the suggestion of the mesmerist, and perfect speech will result, but when the subject comes back to his own suggestions, memory revives the past failures to cause new ones. The only way to defeat the vigilant memory is to so crowd it with successes in talking that the failures have no room. Then the stammerer is cured. Confidence will do much to overcome stammering, but it will not entirely overcome the memory of failures.

The slowness of nature's cure is its only drawback. Everything else is highly satisfactory; no cost; no difficulty; no removal to strange surroundings with the danger of relapse on return; no interruption of occupation. But even the length of time required may be reduced by merely assisting nature in obvious ways; such as resolutely substituting writ-

ing for stammering, and by seeking and improving opportunities for free speech, such as walks with a congenial friend.

Women Acquire Stammering as Much as Men Do.—The manifestations of stammering in women are the same as in men. Through all the long list of peculiarities no difference is found; begins in childhood subsequent to the age of speech acquisition; absent in singing and solitude; intermittent; increases with fear; increases with fatigue; decreases with happiness; ceases under mesmeric suggestion, etc., etc. The causes, namely, stuttering, imitation, fright, shock and illness, are the same. Its severity is no less in women, and some cases are outgrown, as in men. The conclusion would naturally be, then, that women would acquire stammering as much as men do. Then a further conclusion that they have nearly all been cured, would be necessary; because the men stammerers are to the women stammerers as 9 to 1, according to Colombat, Gutzmann, and Cöen, as reported by David Greene. It has been customary to consider that women are nearly immune to stammering in order to account for the discrepancy in the numbers of stammerers in the two sexes. But such a position is illogical in view of the facts already cited—namely that every feature except disparity in numbers shows coincidence; therefore coincidence in numbers should not be abandoned for a less likely explanation. The writers on the subject, with one accord, seem to have taken the illogical explanation, namely immunity from stammering instead of correction after it was contracted. Certainly some women have outgrown the disorder, so it would be necessary only for a large number to outgrow it in order to account for the disparity. The large number of cures in girls compared with boys is readily accounted for on the principle already explained of the prevalence of correct speech over incorrect speech by the fact that the girl stays at home where she gets correction and ample opportunity for free speech, but the boy roams away from the house where he gets neither of these helping influences, but does get the ridicule that makes his stammering worse.

But before we consider the explanations why women are supposed to be immune, let us consider the evidence on which immunity is assumed. Certainly there are comparatively few women stammerers, both according to common observation and statistics. But both our observation and statistics are mostly from the beginning of the child's schooling up to maturity. The period from the time of speech acquisition to the beginning of schooling is sufficient for the cure of many cases of stammering without observation; for parents understand stammering even less than the speech

specialists do, and even the specialists have overlooked much that is of value during that period. The failure to observe that stuttering is a cause of stammering, is an illustration of this oversight. Moreover, the principle by which nature cures stammerers has certainly not been common knowledge, so the possibility of any cures, and especially quick ones, would not occur to the observer. Needless to say it would not occur to those who deny such cures.

Summing up this evidence we see that it is purely negative; it does not show that women are more immune than men, and it does not show that the girls who might have stammered have not been cured. Of course one or the other alternative must be true, for no third explanation is possible. But those who select the immunity explanation take an untenable position because the fact that stammering is in every other particular alike in men and women is presumptive evidence that it is alike in regard to the numbers which contract it.

In support of the explanation by cures of most of the women stammerers we have the certainty of some cures by the process of outgrowing, and the logical explanation of the possibility of many cases outgrowing the disorder on account of the favorable environment of the girl.

On the contrary the theory that women are immune has hardly a leg to stand on. It has no positive evidence that they have not contracted stammering as extensively as men do. The belief in immunity was adopted as apparently the only explanation of the absence of women stammerers of school age and older; but it has been shown that the more reasonable explanation of a large number of stammering cures in girls must be disproved before the immunity theory has a basis for existence.

Suppose, however, we assume immunity in women and see where it leads us. Some women are certainly not immune, so the immunity must be a respecter of persons, unless we take the ground that the few women stammerers are those who were least immune. But in that case the disorder should show less virulence in women. On the contrary women stammer just as severely as men do. Consequently the idea of general, although incomplete, immunity must be abandoned. The immunity must be absolute for some and nil for others. This requirement adds to the already serious difficulty in supporting this imaginary hypothesis.

The explanations of the immunity idea have generally been arguments drawn from the fact to be proved; the reasoning has been, women stammer less than men, therefore they are more immune than men. Such arguments are not per-

missible to show immunity, but it is permissible to show that women are more immune to other similar disorders, and to reason by analogy that they are immune to stammering for the same reasons.

The fact that women are less subject to color blindness than men has been cited to account for immunity of women to stammering. But neither the causes nor the cure of color blindness are known, and the explanations of it are only hypothetical. On the contrary, we do know the causes of stammering, both the inducing causes and the continuing causes, and we know the cure; and we find that girls are as much exposed to the causes, that they have the requisite mentality to make them susceptible,—that is, to make an effort to talk when they find difficulty in talking—and that they are kept within range of the curative influences, namely correction and opportunity for free speech. We do not know that women are exposed to the causes of color blindness, for we do not know what those causes are. And in general, the two disorders are so dissimilar that analogies cannot be drawn safely. Stammering is known both to the victim and to the public; but color blindness is almost never known to either except as the result of a careful examination.

The argument that man has greater variability than woman, specifically that the geniuses and the idiots are of the male sex, especially on the score of a 9 to 1 ratio of men to women, will certainly find opposition from the women, except, possibly, the idiot item. However, leaving such generalities, we can come to the specific characteristic in either man or woman which makes stammering not only possible but imperative, and that is to try to do what one wants to do. No one will say that this characteristic is less prominent in women than in men. All the talk about different mentality, which was excusable when stammering was considered to be caused by a mental defect or by a characteristic lack of logic, must be abandoned in view of the fact that the stammerer has no mental defect, and that his logic is perfect.

The Extirpation of Stammering.—Most books on stammering are written with the view of curing the individual stammerer or of promoting some particular method. The object of this book is the total abolition of stammering. This object can be accomplished by an educational campaign much less extensive than many popular campaigns to eradicate human ills. Society should stop stammering both on its own account and on the stammerer's account.

The way to stop stammering is to stop it. Some may

think that such a procedure would make the poor stammerer dumb. To an extent they are right. For a time he would be partially dumb; but every stammerer does some correct talking, and that correct talking ultimately gives him the impression that he can talk. Then he is cured; for it is only the belief that he cannot talk which makes him stammer. But how about the stammerers who are in positions where they have to talk? Provision should be made for them to write, or they should be given other work.

Although the principle of the cure has been described thoroughly, the proposal to abolish stammering without the consent of the stammerer sounds so revolutionary that more explanation may be needed.

There is only one way by which stammering can be cured, namely, by the prevalence of correct speech over incorrect speech to the extent that the stammerer believes he can talk. This is nature's cure; but it is very slow, because nature cannot make the stammerer write when he fears to talk, neither can she make him seek opportunities in which he talks with the most freedom. Society can shorten nature's cures wonderfully by saying to the stammerer "We must decline to listen if you stammer; take the time to compose yourself, or write what you have to say." The chances are that he would compose himself and talk, or would start to write, become composed thereby, and say the rest without trouble. So a double gain would be made; not only would he retain the confidence which he would have lost by stammering, but he would add to his confidence by talking instead of writing. Some will say that the stammerer has a right to stammer, if he wants to. But that is not so. Society's duty is to protect itself from contagion and against incompetents, and the stammerer is certainly in that class. Also, society is culpable if it is accessory to the continuance of incompetency, and it is so when it allows stammering. The stammerer always has an accessory, for he does not stammer when he is alone. Society can and should decline to be a party to the encouragement of a disorder which is damaging to all concerned. Finally the stammerer does not really want to stammer. He may think that he wants to say the particular word which stops him for the time being, but he is merely suffering under the ludicrous delusion that it is more humiliating to write what he has to say than to stammer it, and he forgets that he is being cured when he stops stammering. Every time a stammerer resists the impulse to stammer, whether he waits until he can speak freely or whether he writes, he is on the way to recovery. If he is so deluded that he cannot see his own best interest, that

is all the more reason why society should take care of him; precedents are not lacking.

The question will arise, " What is to become of the speech specialist?" He need not worry. Except that he will have to put his apparatus and his vocal charts up in the attic, he should do a rushing business for a time. But when the present confirmed stammerers have been cured, his occupation will certainly be gone if society does her simple and easy duty in regard to stammering.

Let us try again to make the matter clear. Society is positively not to go into the business of curing stammering. That would require the giving of special instruction which it is unable to give. Society is merely to decline to listen to stammering. When the stammerer stops stammering, his normal speech will assert itself, he will forget to make the effort that causes stammering and in time he will be cured. Then no more stammering can occur, for the simple reason that no one will listen to it. To summarize, society is merely to assist the natural cures by declining to listen to stammering; her attitude is to be merely negative; the positive instruction for the correction of stammering is to be done by those who are trained in the work. Indeed, where society has entered the work by establishing instruction for the stammering school children, it has done more harm than good, because most modern methods make stammering worse.

This disorder, which has baffled science until now, is probably the easiest to vanquish. The citadel which resisted every means of attack, now that its secret is known, is found to be vulnerable on all sides, and if it is not completely razed to the ground within a very few years society will be guilty of criminal carelessness.

The declination to listen to stammering will completely abolish it within a few years; so it is probably unique for the ease of its eradication; no medicine, no surgery, no skill except for the chronic cases which will seek individual cures or cure themselves or die off. Its termination is as easy as its existence has been persistent.

The proper public attitude in regard to stammering is the first requisite; and that is to treat the stammerer as the lame man is treated. The public foresees his needs and courteously steps in and supplies them. If he wants to make a difficult crossing they take his arm and help him along. If a miscreant kicks his crutch out from under him they promptly pummel the miscreant. They should be as thoughtful to see the stammerer's needs, and should make it just as dangerous to exhibit impatience toward a stammerer as it is to kick the lame man's crutch out from under him, because

the cases are identical; each is a helpless unfortunate, and the treatment confirms his difficulty. It will not be enough to stop open ridicule; the principal obstacle is supercilious impatience, so often exhibited by clerks and public officials. The public can safely say, " We can afford to devote a little time to stopping stammering in view of the big gain in time that will accrue from its abolition." One of the most exasperating things about stammering is the extent to which mistaken feelings aggravate it; the stammerer feels that he will be ridiculed; he feels that he will not be allowed time enough; and the public feels that he is to blame. Stammering would be reduced in intensity one-half if these largely mistaken feelings were removed; and they can be removed by making the stammerer "at home" in regard to his speech when he is abroad. All that is necessary is public knowledge that the stammerer always has the ability to talk, and the disposition to gladly give him all the time he needs, or to wait until he writes.

Little children will be largely instrumental in stopping stammering. One of the time worn nursery rhymes may be displaced by a little rhyme that relates our duty toward the stammerer. No foolish hesitancy will prevent the use of that information. The child that has it will promptly tell the stammering child that he should not stammer, but should wait until he can talk. If the numerous juvenile publications would print a little sane advice about stammering instead of some of the fairy tales, stammering would be checked almost at its inception.

Mothers occupy the best position for preventing stammering. Only a little education about the disorder would enable them to stop it at the very start. The mothers who have never had a stammering child do not realize the importance of keeping on the lookout to guard against it. But that makes the opportunity for the mothers who have stammering children. They will quickly grasp the importance of steps which will eradicate the evil, and they should speak right up in the mothers' meetings, or at any other opportune time, and sound the notes both of warning and of rescue. Doctors and nurses should be required to know the cause and explanation of stammering, the principle of cure, and, at least, the negative means of suppressing it. All teachers, and especially juvenile teachers, should be required to pass an examination in regard to the management of stammering children. This information can be acquired within half an hour, and comprehensive knowledge of it can be shown in a two-hundred word essay; so no teacher fit to teach children would object to the extra labor of acquiring it.

The school authorities should be shown how the oral work is promoting and continuing stammering, so that they will abolish the oral work for the stammerer, and will further see that the stammering child is treated with encouragement and assistance instead of ridicule and derision.

Store keepers should see that their clerks are instructed how to act toward a stammerer. Pure business policy would dictate that. The portraits of the clerks who were hateful to me come to my mind vividly now, although many of them are in their graves. They never knew what humiliation and suffering their unkindness stirred up in a child's heart. The only detail of one place that I can remember is the lowering face of one clerk who used to snarl, " Why don't they send someone here who can talk? " His piercing black eyes, and his gaunt, unshaven muzzle come right up before me as though I had last seen him yesterday, instead of nearly forty years ago; and I have not tried to remember him either. When my father would tell me to go to that place, I wished all the way there that the earth would open and swallow me.

All who come in contact with the public, such as policemen, conductors, ticket agents, etc., should be instructed how to treat the stammerer. The stammerer walks needless miles during his life, just to avoid asking directions to his unfamiliar destinations. On a car the stammerer will risk a long walk rather than the humiliation of a curt remark from the conductor if he falters in saying his destination. Credit is due a large proportion of public service employees for the sincere " Take your time," with which they assist the stammerer; but generally that comes after the latter has failed to say what he wanted to say, and has been obliged to ask for time. The policeman and the ticket agent should learn to recognize stammering just as the bank teller learns to recognize faces. But that recognition should not be accompanied with any sign of impatience, curiosity, or contempt. I have often approached a policeman in a strange city to ask directions, and although his general demeanor has been perfectly polite, his covert but intense glance at my lips to see what contortion I would make next, has been far more confusing than if he had told me to go to the devil.

The telephone companies can do a considerable stroke of business by requiring their operators to treat stammerers intelligently. One day I went into a telephone booth in Amsterdam, N. Y., and took down the receiver. A voice said, " Number." I said nothing, but had nearly composed myself to say what I wanted to say when, " Number," in a sharper tone, upset me altogether. I said, " Central, I have difficulty in talking; won't you give me a little time? "

A sweet voice came back, "I beg your pardon; I did not understand; take all the time you want; I'll wait." I gave the number, and delivered my message swimmingly. Then, with tears in my eyes, I thanked that girl from the bottom of my heart, and went away happy. I do not know any more about her than I have told here, but she will be an angel to me as long as I have recollection. Every telephone girl can be an angel to the stammerers; for if the torments of the damned come to earth they come to the poor stammerer stewing in one of those sweat boxes, when his already confused speech is tied up as tight as a drum by an impatient interruption. A word of consolation then is like radiance from heaven. It will make him talk.

Although the stammerer likes to talk, he shuns the telephone, because he generally has trouble with it. The thought that he cannot give the number—for he cannot substitute numbers as he can words—and the further thoughts that he is hurried, that central will be impatient, and that the person whom he is calling may be slow of comprehension, all these disturbing ideas contribute to defeat him from the start. The automatic telephone solves the difficulty of calling up; but the others remain. The operator who understands how to treat stammerers and has a heart can do much to solve the others. Then the telephone, instead of tending to increase stammering, will decrease it.

Election officials should be instructed how to deal with the stammerer. Many stammerers never go near the polls for fear of speech trouble there, and those who do go, generally hold election day in anxious anticipation for weeks ahead of its arrival. This is especially true when the stammerer moves to a new locality where he is not well known and where his vote may be challenged.

The courts should provide that the testimony of a stammering witness be taken in writing. The testimony will certainly be more reliable, for no severe stammerer can say exactly what he wants to say. In ordinary conversation he gets along by the use of synonyms, but that should not be permissible in a court of law, for the truth, the whole truth, and nothing but the truth cannot be obtained when it is related according to the words that are easiest to say. The prospect of undergoing a severe cross examination in court is a nightmare to the stammerer. There is not the least doubt that the fear which haunts his mind, even when the chances of realization are slight, makes such a deep impression of his trouble that his stammering is increased.

Employers of stammerers can be highly beneficial in suppressing stammering. They should contrive to give the

stammering employe as much opportunity to overcome his trouble as business tempered with generosity will allow. One of those opportunities is the privilege of writing when stammering is inevitable. If the employer will say, " To please me, write instead of stammering," the writing would be done. But if the remark is, " You can write it if you want to," the stammerer is likely to think that he will lose favor if he admits defeat, so he will go down to certain defeat by trying to talk.

PHONICS IN RELATION TO EARLY READING

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A method or system which in itself is perfectly consistent and well ordered possesses some compelling fascination for the teacher. When such a method is formulated it is pounced upon with avidity and is made to do duty in teaching children how to write, to read, to spell, or to figure regardless of whether the children need to know the particular material, or whether they are physiologically and mentally ready to learn the particular matter in that particular manner. The superficial character of these ready-made methods is attested by the short lives they generally lead. While living, however, they flourish vigorously, and apparently the children for the time being make rapid progress.

These exclusive and all-sufficient systems of teaching particular subjects do result in a gain for pedagogy at least. Their very exaggeration and emphasis along some special line sometimes make clear a phase of the work before not sufficiently analyzed and understood. The Speer method of teaching arithmetic brought to light the value of the ratio idea in number, but to attempt to make ratio the keynote to the mastering of all arithmetic is absurd. The Palmer method of teaching writing is a seemingly simple, well gradated system, but if the physiological and mental basis of writing be examined the Palmer method will be found to violate some of our established laws of child growth and learning. This is true of the concentric plan of teaching subjects, of the Grube method of teaching arithmetic, of the Augsburg system of drawing and of the "phonic method" of teaching reading.

It is upon the last mentioned "method" that I wish to comment. The hold which "phonics" still has upon some schools has been called to my attention by the exaggerated importance attached to it by students, who seem to feel that they are absolutely unqualified to teach reading if they do not know how to teach it by phonics. The marvelous number of words a child learns to recognize in the first year is pointed out by them as the all-sufficient argument in favor of this method of beginning reading.

Education cannot be evaluated in terms of immediate results.

I have seen almost perfect sewing, drawing and painting obtained from young children and I know the results were forced, not products of the children's own growth and development. Moreover, certain late investigations tend to show that the effect of highly analytic or intensive work in early years for which the organism is not mature is to cripple ability. So no matter how fascinating the results in ability to decipher words from the use of the phonic method, if it is gained at the expense of the child's normal development of what value is the information thus acquired? And, further, is such ability to pronounce new words the most important and fundamental factor in learning to read?

I take up the latter question first. It seems trite but necessary to reiterate that reading is *not* word pronunciation or recognition, and *is* the gathering of thought from the written or printed symbols. Now what kind of a reader do we wish to make? If he *is* a reader he is, from our definition, after thought, not words; but he must also be able to get the essential thought in the minimum of time, and also he must be able to revel in the thought without feeling the obtrusion of the mechanics of reading.

We must take account of the psychology of the reading learning process. The association which is important to make is that between the idea and the symbol. The thought symbol should immediately suggest its thought without interfering associations of imagery of separate elements, whether the imagery be visual, auditory, or motor (speech), of letter, elemental sound, or word. Naturally the general form or a particular part of the sentence, phrase, or word, or even a letter of a word serves as a cue to the thought, and the auditory motor cut-off imagery of important words may follow visual cognizance; but the point is that we do not wish deliberately to put interferences between the visual symbol and the idea.

A child in learning the spoken language does so primarily for sake of meaning, and he learns the word, phrase, or sentence as a whole, not an element at a time. He also listens to others speak primarily for the sake of meaning. It seems that here is analogical argument for keeping the thought prominent and closely associated with the symbol in learning to read. Judd says, "The most natural fusion (association) is always the one for which the child's past experience has partly prepared him;" so the sentence, phrase, or word which has meaning, not the meaningless alphabetic or sound element, is from this view the starting point in teaching reading.

Experiments by Cattell, Huey, Dearborn and others all seem to prove that even with older readers meanings are rather at-

tached to phrases and sentences than to words, and not at all to letters and sounds. Moreover, the visual spans for letters, nonsense syllables, words and phrases show that as many words as letters may be cognized in a single act of attention, and that more words than nonsense syllables are obtained. The mind plays a large part in interpreting meaning. Those readers who use visual cues alone, or have the least interference from auditory and speech imagery between the visual cue and the thought are on the whole the fastest and most intelligent readers. It follows that much emphasis upon the mechanics of reading, such as getting the words first by sound and spelling, and a large amount of oral reading emphasize imagery that distracts attention from thought by being put between the visual cues and thought.

A study of words—pronunciation, spelling and derivation—is really a part of language work, not of reading. I believe I am not rash in making the assertion that our children come out of the elementary school with the feeling that reading consists of oral utterance of thought with a minimum amount of mispronunciation and a readiness to define words. I asked a class of thirty-six students just out of high school for some reminiscences of their study of reading in the elementary school. From this I gathered that about twelve remembered they were told to reproduce or explain the thought, seventeen reported that they could remember no directions given in regard to study unless it was to define and pronounce words, fifteen felt the emphasis placed upon pronunciation and definition, while about eight said the emphasis was on one or the other. This was a class of poor readers in the sense that they did not quickly gather the essential thought from the printed page.

Dr. Huey was of the opinion that diacritical marks, so often found in phonic readers for beginners, should not be there as they focus attention on letter sounds; hence making the reading rate slow, and shifting meaning to the fringe of attention. He said the reading rate should be rapid from the first and "if the words of the page are not already familiar and their meaning cannot be suggested by their context or by an illustration, it is simply destructive of habits of natural reading and speaking to interrupt the reading with thoughts of letter sounds, which are never formally and focally present in actual reading." The result of such interference is undoubtedly to be found in the monotonous, mechanical, word-calling reading found in our schools, and the inability to quickly seize essential thoughts from the printed page, which we are constantly contending with in secondary and higher schools.

There is no doubt that analysis must enter into the mastery of the mechanics of reading at a point not too far removed from the beginning of the study of reading or else pupils become helpless and dependent, but this does not mean that analysis must at any time *usurp* the attention and be made the most important feature of the learning process. It is subordinate and must be kept subordinate. Miss Laing says, "During the reading activity the value of any method with words must be determined by its power of becoming tributary to that particular thinking process that is reading. Training in phonics or phonograms carries with it a tendency to secure recognition through form alone."

To sum up, the point of the preceding discussion is simply that the word must be met in some meaningful context, and should be mastered at first through context. Even older children who are equipped with analytical aids to word recognition should attempt first to decipher the meaning of a particular word from the context and then bring phonics, spelling, derivation, etc., to help them recognize, understand and remember. Such findings as have just been reviewed would preclude analytical work involved in phonics from being used either as a preliminary step to reading, or as an aid to word recognition in the early stage of learning to read. There are other findings which show the practice of beginning phonic analysis in a first grade to be a vicious one. Indeed, experimental studies seem to indicate that intensive reading itself in whatever way taught is harmful to children below the physiological age of eight.

I will not go into the question of the relative importance of book knowledge and that gained through experience for the early years. We agree that broad experimental knowledge is fundamental, and that the practice of conning books as the only source of information is a relic of mediaevalism. Dr. Dewey well expressed the popular attitude when he called reading the fetich of the elementary school.

If all teachers would take the trouble to read some account like Huey's of the eye movements involved in reading they would realize that it is a very complex activity involving fine adjustments for even the trained adult. Now then we are told by Flechsig, Hughlings Jackson and other neurologists that the nerve innervation of eye muscles from upper brain centers for continuous work such as writing, sewing, reading, etc., is not matured until about the age of eight. Whipple does not think that the main difficulties with eye movement have passed even by the age of ten years. The children he examined made more and longer fixations than adults and were

more uncertain of their movement. We also know that children's vision is naturally hyperopic, and that hyperopia as a defect exists to a large per cent. among children. When children with hyperopia, or astigmatism, are put at near work they often develop esophoria, one type of disturbance of motility of the eye, which may become serious. Again, we know that myopia is a disease which increases rapidly from the time of school entrance, although we cannot state positively that the school is its cause. Why do we insist upon crippling the eyesight by demanding attention to a subject that is not of first importance to beginning education? Children should have literature from babyhood and plenty of it, but the natural way and the easy way is to get it through the ear.

Just as the eye and the hand have been found not ready for work requiring fine adjustments and co-ordinations before the age of eight so, too, has it been found that the vocal organs are not sufficiently mature for the fine work of analyzing speech into its elemental sounds.

The period from six to eight years is one of rapid, unequal growth of parts so that even the larger body co-ordinations of the previous period are interfered with. Second dentition occurs at this time, bringing disturbances in the mouth and increased nervousness. In the lower grades, particularly, the boys' breathing is irregular, and Gray concludes that they cannot read well here and ought not to be taxed either with too much oral reading or with singing. It is during the period of second dentition that children seem most liable to speech disturbances. Stuttering increases rapidly during the first years of school, and many investigators, Bell, Hartwell, Scripture, Terman and Huey, attribute it in part to the early phonic drills which require too fine adjustments of the immature vocal organs. Hartwell says, "the schools are the breeding ground of stutterers."

In a preliminary report of speech defects among St. Louis school children, Wallin says that a large per cent. of the stuttering cases developed before school entrance and hence phonic work cannot be held responsible for a majority of them. The question obviously needs further investigation. Possibly phonics accelerates the development of already established stuttering. Every once in awhile I hear of isolated cases of stuttering which seem directly attributable to school phonics. I have a boy in mind now who was developing stuttering, but who did not become a confirmed stutterer because his mother insisted that the teacher desist from teaching him by phonics.

Huey says, "Attention of the child is called to the 'how' of utterance and mouth consciousness results, which inter-

feres with a process meant to function automatically." I know of no investigation that directly proves phonic drills to be the cause of the increased amount of stuttering during the early school years, but there seems to be fairly good ground for assuming it to be one of the causes.

Prof. Scripture says that the vocal organs are uninterruptedly in action during the utterance of a word, phrase, or sentence. Thus words in phrases or sentences are not separated from each other. The only divisions which could possibly be are, according to Prof. Sweet, those of breath groups. The rises and falls in inflection give the effect, so he thinks, of syllable division. Both of these authorities hold that a word uttered alone has not the same sound as when uttered in context. A letter has not the same sound alone that is given to it when used in a word, and the vocal movements that are made in uttering the isolated sound cannot be the same as when uttered in context.

It is interesting to note that Miss Bowden found that children in learning to read exhibit no tendency to analyze words into elemental sounds of their own free wills. This is of course not an argument against the use of phonic analysis but it should lead one to question an early introduction of analysis and the making of it *the* most conscious means of word mastery.

Although we have not had the opportunity to make a studied comparison of readers who have learned word recognition through emphasis upon phonics and those who have learned first through thought and association with thought, we feel rather sure that our slow, mechanical, word calling readers have generally become so through the former kind of training, and that our quick, thought gathering readers have been trained by the latter method. This seems to be in line with the observations or inferences of nearly all the careful experimenters such as Huey, Dearborn, Laing.

If weight is given to the above discussion a procedure for the teaching of reading must observe the following:

(1) Intensive reading has little if any place in the work of the first two years of the elementary school. There are two very well established arguments against it: 1st. As Donaldson says, this is the period for recognizance—getting acquainted in many fields, especially at first hand; 2nd. Fine work like reading entails a premature adjustment of eye and vocal organs which is very harmful.

(2) The mastery of words should be approached through meaning in context and all other aids should be kept subordinate to this.

(3) Any method whereby the mechanics of reading is emphasized tends to attract attention to the mechanics rather than the thought and to produce slow, mechanical readers.

(4) To begin a study with analytical elements or to made analysis early in the study of a subject is not in accord with recent pedagogy. Moreover, if reading must be taught in the first year of school life phonic analysis should be given little place, if any, because of immaturity of children for analytical work.

(5) Sounds have different values isolated and combined. Too much dwelling upon isolated sounds in the immature years may cause stuttering, prevent a ready flow of words in reading, and even produce incorrect pronunciation through maladjustment of vocal organs.

The function of phonics has not been rightly interpreted. An article on Phonetic Reading in the *Western Teacher* has just been put into my hands in which the author entirely ignores the child process of growth and the psychology of reading and gives as his main argument for teaching reading by phonetics that "the phonetically trained child in his first school year easily masters a thousand words." He adds that "if taught correctly the child has the key to reading." I cannot refrain from quoting the author further—"the average child taught by the word-and-sentence method does well if he masters two hundred words during the first school year." Miss Bowden succeeded in teaching beginners in eight weeks 147 words which they could recognize in isolation and context, 127 of these were known in isolation and she used no analysis whatever.

Most writers who advocate the early use of phonic analysis take it for granted that reading is the principal subject of the first year of school and that the great aim to be accomplished is independent recognition of the largest vocabulary possible. They are certainly mistaken in both views.

It is true that no piece of work is rationalized until analyzed. No piece of work may be most effectively done until analysis has taken place. The most effective movements for throwing a ball could not be first learned one at a time. The whole movement is attempted through trial and error, imitation, suggestion, but if left here the movement may be of a low order. There comes a time when attention needs to be directed to this element and that, in the movement, in order to correct or improve the whole. This is true in learning to draw, paint, write, talk, etc. So phonic analysis has its place in aiding a child to become his own master of word recognition and word pronunciation. Indeed it must not be neglected.

The only contention here is that phonic analysis must not be taught too early in the child's life or in beginning reading. It must be kept subordinate to reading as thought gathering at all times.

Phonic exercises may perform another function—that of correcting faulty articulation and enunciation. Children with such faults who fail to learn through imitation should be shown the correct placing of the vocal organs, for elemental sounds made incorrectly.

Teachers, however, need more scientific training in phonetics. The ordinary teacher has little knowledge of the sound values of letters or of how to make them, i. e., witness the vocalization in the sound of ' th,' ' d,' etc., in any school room.

Education is not merely a question of what a child *can* do. We needs must make him a possessor of adult knowledge. The question is when and how rapidly is it *safe,* from the standpoint of child growth and development and the results upon his growth and development, to do so? When are we going to learn to evaluate school work on some other basis than the quantitative? When are we going to see that our methods must take advantage of and work in harmony with the laws of mental and physical growth?

True we are still much in the dark in regard to the time when the physical and mental conditions are mature for different kinds of activities, but there are enough data to warrant a procedure which postpones highly artificial and complex activities such as writing and reading beyond that period which presents uneven growth, is low in control of activity dominated by higher brain centers, shows little ability in accuracy and steadiness and is highly susceptible to fatigue. No doubt maturity for co-ordinations of reading and writing may be accelerated by the use of gradated activities which tend to use first, the fundamental movements dominated by the spinal cord, second, the less fundamental and more complex controlled by the lower brain centers, and third, the so-called accessory movements which are the last to be learned because dominated by the higher brain centers. And if we can legitimately accelerate growth we should learn how to do so. The Montessori system is an experiment in this line.

The method of learning to read which a child naturally employs is in accord with the findings from the various sources which we have discussed above. The child from his, " What does that say? " learns to read signs, bill posters, newspaper and magazine names, labels, etc. He also reads the titles below the pictures in his story books, and can soon tell where " it says, ' Baa, baa, black sheep,' and ' Ding dong bell.' " Recog-

nition of words as separate elements follows easily, especially of those that arouse concrete imagery. When the need is felt for other than context aid in understanding words derivative, phonetic and alphabetic analysis may be introduced. Thus the child may gain a mastery over word recognition, not through viewing all words as series of separate sounds to be organized into wholes, but as carriers of meaning, which his knowledge of alphabetic, phonetic and derivative elements helps him to define more quickly and accurately.

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PRESENT PRACTICES AND TENDENCIES IN THE SECONDARY EDUCATION OF GIRLS

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The education of the adolescent girl, or the girl of secondary school age, presents many peculiar problems. We in this country have been inclined to believe that co-education is the reply to almost any question that can be raised relative to the training of the girl below the college, and in most communities, until very recently, it has been identical education as well. This is quite in accord with the working out of the democratic ideal, and has perhaps been necessary to demonstrate woman's mental and physical fitness for scholastic pursuits. But within recent years have come stirrings and searchings of conscience. Dr. Hall's "Adolescence" was a bombshell in the educational world, demanding as it did that our educational practices justify themselves by the scientific study of the child. Dr. Hall's work, of course, attacked the problem from the psychological standpoint; on the other hand, social and economic considerations, which are prompting the formation of special schools and the introduction of vocational or industrial courses, have begun to direct attention to the education of girls as a form of special education. And so it has come about, quite recently, that various experiments are being tried, looking toward a better understanding of the girl herself, and a more intelligent attempt to help her find her place in society. This paper will confine itself to a study of such experiments, for as yet they are little else,—as are in progress in the public schools of this country at the present time, and will consider—

I. Segregation, either in separate schools, or in separate classes within the same school.

II. Home economics, or Domestic Science and Arts courses, whether conducted wholly within the school, or with credit for home work.

III. Housecraft or Homecraft schools.

IV. Vocational courses and trade schools.

V. Continuation schools.

I. Segregation

We have here to consider first the public high schools for girls, which are not, of course, a new institution, but are in most instances schools which have been in existence for some time, and they represent the more conservative opinion regarding a girl's education which still prevails, chiefly in the East and South. But the decidedly new departures from the traditional courses of study seen in some of them bring them within the limits of our study.

In 1914, according to the Commissioner's report, there were 28 of these schools, which were distributed as follows: Massachusetts, 4; New York, 4; Pennsylvania, 5; Maryland, 4; South Carolina, 1; Georgia, 4; Louisiana, 2; Kentucky, 1; Illinois, 1; and California, 2. The total number of girls in these schools was 34,362. The two States of New York and Pennsylvania have over 60 per cent. of the entire number, while if we include Massachusetts and Maryland the four have over 80 per cent. Philadelphia has no mixed high schools, and Baltimore has none for white pupils.

One of the best known of the public high schools for girls is the William Penn High School in Philadelphia. Its principal is W. D. Lewis, the author of a little monograph, "Democracy's High School," which sets forth the principles of the school.

These are, in brief, something as follows:

The first duty of the school toward the adolescent girl is to conserve her health. The home, under present conditions, whatever it ought to do, is not doing it. To this end the school should begin with a thorough physical examination, which would note defects that call for individual treatment; it should notify the home where medical care is needed, and should itself undertake many tasks for physical improvement that it can perform much better than any other agency. It should give a thorough course in personal and community hygiene, with physiology enough to make it intelligible. It should require every girl in the school to take this course the first year, so as to reach those who drop out.

As a second essential, the school should give to every girl a thorough and systematic training to fit her for efficiency in the home. This training should include child hygiene and child psychology. A third duty of the school is to give to the girl a training that will enable her to earn a living wage.

The course of study "must be so administered as to be easily adaptable to individual needs. It should provide for the girl of scholarly ability and ambition and plenty of hand-

work and practical training for the large majority who have no distinctively intellectual interests. It should require of every girl both mental and manual work throughout her course; it should give her the fullest instruction she can assimilate in oral and written English and in the masterpieces of our own literature. It should require of all some acquaintance with scientific principles as applied to daily life, some familiarity with business practice and elementary accounting, and an introduction to the economic and governmental activities of organized society." To put all this briefly in his own words—"The high school's largest possible service, so far as the girls are concerned, is to conserve their health, train them for household efficiency and economic independence, and bring them into touch with the larger social and intellectual interests of humanity."

The William Penn High School runs 4 courses, the College Preparatory, the General, Commercial, and Art and Home Economics course. The last two may be taken with or without a foreign language. Except for the emphasis upon biology and hygiene in all the courses in the first year, they do not look very different from the courses in most of the high schools in our larger cities. But according to the monograph, the method is very different from the traditional one. Dr. Lewis' fundamental thesis is that the high school is a coöperative agency for social service, and its aim training in right social thinking.

Another great public high school for girls is the Wadleigh in New York City. This school has recently organized a home-craft course very different from the ordinary type of domestic science course. "It includes the home-making subjects, but it makes novel provision for vocational study and puts a distinctly present-use valuation on all subjects. There are new subjects dealing not only with woman's home work, but with her social relations,—historical, legal, cultural, economic. Latin and Greek are not heard of; the modern languages are elective; in mathematics a year of household arithmetic is required, and also another year of mathematics. The other required general subjects are a year of English, a year of biology, two years of drawing, two years of music, four years of physical training. The required subjects of household concern are: Domestic science and domestic art, two years of each; hygiene and sanitation, household management, social efficiency, and essentials of conduct." (Quotation from U. S. Bureau of Education, Bulletin 1914, No. 37, "Education for the Home.")

We may mention another great girls' high school, that of

Louisville, Kentucky, which has an enrollment at the present time of 1,635 girls. A recent letter from the principal reads: "We have no domestic science and home economics course so-called, but we offer work in these subjects and give full credit for it. Within a range of 10 electives of the 32 points required for graduation, a student may substitute work in these subjects for text-book subjects. At present 365 girls are taking the work in cooking, 352 girls the work in drawnig; this latter is closely correlated with the Household Arts work. Two hundred and eighteen girls take the work in sewing, and 41, the work in millinery. In all these courses the normal time devoted by a pupil is two ninety-minute periods a week on consecutive days. In addition to the above there is one class of 24 girls in Vocational Cooking. This course is designed to prepare a girl for lunch-room management, catering, etc."

In this school they give credit for work done under private instruction in piano and other orchestral music. In this way a girl musically inclined may, during the 4 years secure 6 of the 32 points required for graduation. They also maintain an elective course in vocational English, which studies ad-writing, newspaper reporting, etc.

These instances will serve as examples of how the public high schools for girls are keeping abreast of the times.

Next, we find some experiments in segregation that are being tried out within the co-educational schools. The writer has not been able to discover many schools where this is being done. Certain schools in Seattle, Washington; in Fresno, California; in Muskogee, Oklahoma; in Richmond, Indiana; the Englewood High School, in Chicago; the high schools in Columbus, Ohio, and in Hackensack, New Jersey, the Junior High School in Clinton, Iowa—there are doubtless many more, but these are all of which we have first-hand knowledge. Of these 8 schools, 4 separate the classes in science; 3 in physiology, physical culture, and manual training, either through all or a part of the course; 2 separate in drawing; Seattle, where it has been in operation for something more than a year, would segregate all science classes, as well as mathematics, English for the first two years, history the first year; in the Junior High School at Clinton, Iowa, the boys and girls are organized in separate rooms and classes as a matter of convenience in sending them to the manual training and home economics work. The reasons given for segregation in these 8 schools agree pretty well in emphasizing the practical aim; only one of them neglects to state it, giving a purely psychological reason. The three schools that segregate in

physiology find that they can teach sex hygiene thus, though that was not the primary reason for adopting the plan. As to the advantages derived from segregation, the following are some mentioned:

"It gives the teacher a closer touch with the pupils, and the instruction is much more effective and valuable."

"The pupils are more interested and the teachers find it easier to adapt their teaching to their particular needs."

"More students (the girls, presumably) are now taking science than before (when all had to take College Preparatory Physics) and not so many drop out."

"It makes a big improvement in the adaptation of the science work to girls and boys."

"Our own observation and the opinion of many of our patrons confirm us in the belief that the experiment is well worth while."

Englewood is, however, the only school that we have been able to find that has carried out the experiment systematically for an appreciable time, and attempted a scientific evaluation of the results. The experiment began in 1905 under Principal Armstrong, who was strongly of the opinion of Dr. Hall that the great discrepancies in development between boys and girls in the first high school years was sufficient warrant for different treatment. In an article in the *School Review* (Dec., 1906) he says, "As children of 14 enter the high school, the girl is from one to two years more mature than the boy. She is already a woman in seriousness of purpose, in power of application, and in womanly instincts. He is but a playful little fellow, not yet weaned from marbles and peg tops. . . . I would not have them attend separate schools, because of the loss of social influence upon each other; but I would grade them by sex in order to put those of like mind and purpose together."

After four years of trial of the system, Principal Armstrong published the results to date. They are certainly striking enough to warrant close inspection. Of the 38% increase in the number of girls in the 10 years, 94% was after segregation had been in operation, and of the 96% increase in the number of boys, 79% was after segregation. This might, of course, have been due to a variety of causes, but Principal Armstrong has ruled out all the other factors, that, so far as he was able to discover, might have been operative. The increase in the ratio of boys was in spite of the fact that manual-training courses were introduced into the school in the meantime which attracted fully twice as many girls as boys, and that a large manual-training high school for boys

was opened in the neighborhood which attracted boys from all over the city, and transfers were freely given to any boys of Englewood who wished to enter it. However, the graphs showing scholarship are just as striking. Boys are compared with boys and boys with girls, and in every case the scholarship of the boys shows a great improvement. The boys of one class, 1909, were higher than the girls of their class from start to finish, which was an unheard of thing in the school, as it is, we believe, in most mixed high schools. Throughout the course of the experiment the principal kept in touch with the opinion of parents, teachers, and pupils upon the subject, and there seems to have been great unanimity of opinion regarding its value. It must be kept in mind that segregation was practiced during the first two years, what differentiation there was later being determined mainly by the demands of the course of study. However, when Mrs. Young took charge of the Chicago schools, she was not in favor of the separation of the sexes, and the experiment had to be abandoned, except where it could be made upon the ground of better adaptation, as in the classes in Household Physics, Engineering Physics, etc. Principal Armstrong, however, is still convinced that it is an eminently desirable course to pursue.

II. Home Economics, Domestic Science and Arts Courses

The first high school to introduce domestic science was in Toledo, Ohio, in 1884; the next year it was offered in the high schools of San Francisco. A few other large cities followed suit, but not till within the last decade did the great development of the subject take place in connection with the industrial education movement. This movement was begun in Massachusetts in 1906 by the industrial education law, and more than three-fourths of the States have since followed her example. The household is now given full recognition along with agricultural, industrial and commercial vocations, as a field for which the State should give preparation. In 1914, 33 States had thus recognized the teaching of home economics, and in 29 of them State aid is given to secondary schools maintaining such courses. In October, 1914, 2,440 high schools, out of the 11,515 in the country, reported registration in courses in home economics. But a statement like this tells us little of what is actually being done in these schools. No doubt to some of them domestic economy means a little fancy cooking, while on the other hand the list includes cities like New York and Cincinnati in which elaborate vocational courses are maintained. The following tables, compiled

from 288 representative high schools, may give us a better idea.

TABLE 1*

High School Courses	Number of courses reported	Minimum and maximum hours of instruction reported	Median hours of instruction	Limits which include half the courses, hours of instruction	Modal hours of instruction
Elementary cookery	253	24–450	96	57–163	54, 57, 72, 80, 108
Advanced cookery	175	5–400	80	54–152	40, 48, 54, 57, 72, 80, 108, 120
Cookery for sick	58	1–360	26¼	12–76	
Food chemistry	57	1½–266	60	34–120	40, 72, 120, 200
Nutrition, dietetics	49	1½–120	40	24–71½	
Elementary sewing	230	12–600	108	54–108	72, 80, 108, 180
Dressmaking	126	14–450	101–108	54–160	72, 160, 180
Millinery	34	18–200	76–80	40–120	
Textiles	31	6–320	53½	18–20	
House	26	4–180	20–24	15–72	
Household management	31	5½–133⅓	36	18–72	
Household accounts	20	4–126⅔	24	12–76	
Housewifery	23	1½–270	36	13–45	
Home nursing	24	3–360	15–18	12½–40	15
Care of children	6	3–45	9–25	.....	
Laundry	27	4½–120	36	12–47½	
Household sanitation	26	4–120	32–33⅓	24–54	
Household design	23	4–180	33⅓	15–60	
Costume design	14	1½–240	63–67½	45–76	

TABLE 2

	Food courses	Clothing	Shelter and management
Number of schools offering	257	232	72
Percentage of schools offering	89	80.5	25
Smallest and largest hours offered	24; 1, 200	14; 1, 240	3; 680
Median hours offered	189	175–180	54–62
Modes	54; 80, 108 180; 240 288; 360	72; 180; 288 360	

* Tables taken from "Education for the Home," Bulletin No. 37, 1914, pages 106 and 107.

The courses may be grouped under food, clothing, and shelter and management. It is evident from the tables that more high schools are offering courses in cookery, food chemistry and dietetics than in the clothing subjects, including sewing, dressmaking, millinery, textiles, and costume design, while the third group of courses, shelter and management, is as yet, in the schools under consideration, very much behind the other two, appearing in about one-fourth of them. A third table, which we shall not give here, gives the time allotment for all subjects combined, by total hours, in which the mean appears as 304-315 hours of instruction, and, according to the above report, this may be taken as the typical number of hours of home economics teaching actually given in the American high school at present.

Coöperation with the home has taken various forms. Some schools in which equipment for domestic science teaching could not be procured, have presented problems to be worked out at home and later reported upon at school. At Berlin, New Hampshire, a kitchen, laboratory, and dining-room were installed, and the problem of the cost of food material was solved by "borrowing the material from the neighbors," and returning the finished product to those who furnished the "raw material." There is also the so-called "Crete" plan, which originated in Crete, Nebraska; according to this plan the women of the neighborhood teach groups of girls in their own kitchens, each woman taking some feature of housekeeping in which she is specially interested or expert. The bulletin quoted above finds that of 232 high schools reporting, 55, or 23%, had some form of coöperation between home and school in their domestic science work.

III. Housecraft or Homecraft Schools

Within very recent years a new type of household training has appeared, namely, the so-called housecraft school. Perhaps the pioneer school of this sort is the "Home School" at Providence, R. I., which was opened in the fall of 1911, under the superintendency of Mr. Randall J. Condon, now of Cincinnati. Mr. Condon had become convinced several years before that the domestic science courses then in operation were far from meeting the real needs of the situation, and that the work of the school should be more closely correlated with the work of the community. It seemed to him that a girl's education ought to consider the fact that in all probability she will marry and take charge of a home, and that whatever else is given her in the public schools, every girl ought at least to have an opportunity for training in the duties

and responsibilities of the home-maker and housekeeper. The ideal place to give this training is in a real home—so there you have the genesis of the Home School.

A five-room flat was selected in one of the thickly settled and poorer districts of the city; the problem of its renovating and furnishing was given to the pupils of the Technical High School, who were thus confronted by a practical application of their theoretical work. Boys as well as girls worked at the task, which was not finished in detail, as that was left to the girls who were to be its students, thus imitating as closely as possible conditions in real life. When the school opened there was a grand rush of girls—it had been well advertised—and many had to be turned away. The first week over 175 girls were enrolled, and there was a long waiting list. The work is divided into three parts, the sewing, cooking, and housework, a teacher being in charge of each department. The girls are in groups of 10, one group to each teacher, and the work is so alternated that every girl receives the work in each department. In addition to the work outlined above there is a course in hygiene, in which the emphasis is upon personal hygiene, with instruction in sex-hygiene, and informal talks on books, pictures, nature study, etc. The daytime girls are above 13 years of age, while the evening classes are made up of older girls, most of whom are working girls looking forward to homes of their own. The courses are elastic, planned more with a view to meeting individual needs than the fixed demands of a class, but are so arranged as to offer a two-year course for the older girls and a three-year course for the younger ones. The work is not, strictly so-called, secondary, since a girl can enter it without completing the formal grammar grade work, but the age requirement puts it under the head of training for the adolescent, and the idea might well be applied in the junior high schools. The aim, as has perhaps been inferred, is partly vocational, partly cultural; expressed in the words of Miss Trowbridge, one of its first teachers, "the idea is not merely to make the earning capacity of a girl greater, but rather to develop from the stratum where economic pressure is greatest, a new type of woman—clean, intelligent, industrious, and competent." The school takes advantage of the various social organizations that offer helpful influences, such as the Public Library, the Museums, the District Nurses' Association, the Young Woman's Christian Association, and others. It has a well chosen library of its own, and the girls have charge of a flower and vegetable garden where the aim is distinctly practical. The play spirit finds expression in school parties, in evenings of games and plays

and musical evenings; and trips to museums, art galleries and the country help in the development of the whole girl. The school is a part of the life of the neighborhood in much the same sense that the Settlement House is. There are some other cities in which the plan is being tried, and it would seem to offer a particularly feasible solution of some of the problems connected with the education of girls in the class where, as Miss Trowbridge puts it, the economic pressure is greatest.

IV. Vocational Education

So far we have been considering schools and courses whose aims were not strictly vocational or only partly so. Let us now turn to those which have as their chief aim the preparation of the girl for some trade, business, or industry where she shall earn a wage, that being the sense in which "vocational" is used in this paper. So we have here to consider first, commercial or business courses and schools; second, trade or industrial courses and schools.

Commercial or Business Courses.—From the beginning the commercial courses and commercial high schools have attracted large numbers of girls. Clerical work and stenography and typewriting are fields peculiarly attractive to women, and by far the larger number of persons so employed are of the female sex. Not only do girls crowd into the commercial courses in the public schools, but they swell the numbers of the private business schools, many of which could not exist without their patronage. A study of the conditions in 16 of the largest American cities, made two years ago, shows a considerable proportion of all secondary pupils enrolled in commercial classes, and the author of the report says we are probably spending more to-day for the commercial course than for any other single course in the secondary school. But just because business education is so well established we hear less about it, and do not regard it as a live issue in the sense that we do industrial training or training for the home. But the great number of girls enrolled in these courses makes them of interest in our study. The report quoted above declares that the girls are benefiting from the course as planned at present at the expense of the boys, who find their training of little advantage to them because the demand is for women instead of for men. None of the 16 cities investigated make any effort to differentiate the courses, apparently taking it for granted that boys and girls meet the same demands in business and must be trained in the same way.

Trade and Industrial Schools.—As yet the schools of this type for girls are decidedly in the minority. The demand for

industrial education was naturally at first for the boy, since upon wage-earning depends his fate not merely for a time, but normally throughout life. But the great numbers of unskilled girls who crowd into industry every year, as well as the demand for competent and trained workers in various trades and industries has led to the establishment in various parts of the country of trade or industrial schools for girls, or of courses in the high schools already existing. The separate trade schools for girls are few as yet. Several of them were established and maintained for some time by private initiative and were later taken over by the State or city. Thus the Boston Trade School for Girls, and the Manhattan Trade School in New York, were conducted for several years as private enterprises.

The Educational Directory of the Bureau of Education for 1915-16 lists 11 of these trade or vocational schools for girls, exclusive of the schools for colored children. These are distributed as follows: Massachusetts, 3; Connecticut, Louisiana, Michigan, Minnesota, New Jersey, New York, Oregon, and Wisconsin, one each. Several of these schools have been in operation only a year, or even less. The Trade School for Girls in Worcester, Massachusetts, will serve us very well as an example. This school was organized something over three years ago, after a careful survey conducted by the Research Department of the Woman's Educational and Industrial Union of Boston. The report of this investigation brings out very clearly the fact that the problems of industrial education differ with the community, and that the school to give proper service must adapt itself to the community in which it is situated. Since in Worcester the machine-operating industries are those in which by far the greater number of girls and women are employed, the report recommended that the school should emphasize these courses, as well as part-time or continuation instruction, in order to minister to the needs of women and girls who are already employed and cannot, for one reason or another, give full time to the school. The school was organized on this basis, but gave also courses in the other feminine industries, cooking, sewing, and millinery. It now employs 24 instructors in the day school and 27 in the evening school and is filled to its utmost capacity in both day and evening classes. There are classes in cooking, sewing, millinery, power machine operating, physical education, art and academic subjects. A class in trade cooking operates a cafeteria in the Boys' Trade School Building, and is composed of girls who are interested in opening tea-rooms or food sale shops. In a conversation with one of the teachers in this school a few

days ago, the writer was told that the great demand for instruction had not been what the report anticipated, but is in the homemaking subjects; the girls are especially interested in knowing how to make their own clothes. Moreover, the girls in this school are by no means girls from the poorer classes. The fact that they are in school beyond the age when they are legally required to attend, is proof that they are in a position to remain in school if they choose. Though most of them will probably go to work when they leave school, and many of them, doubtless, remain in school at some sacrifice on the part of either themselves or their parents, they are not from the class that economic conditions force into work at the earliest possible moment. Another fact gives emphasis to this: the demand for the homemaking courses is so great that the director is contemplating a four-year course in the subject, which will be one of the first of that length to be established in a secondary school.

The Boston and Cambridge Trade Schools for girls give practically the same courses as are given here, but with more emphasis upon trade dressmaking and millinery. The Manhattan Trade School, in addition to the above, offers course in the making of novelty goods and Trade Art; the Francis T. Nichols School of New Orleans offers a one-year course in Art Needle Work and a three-months' course in laundering; the Girls' Vocational High School of Minneapolis is organized on the half trade and half-allied-academic work plan, the object being to prepare the girl to earn her own living and also to give her as broad a training for life as is possible in the two years of the course. In all these schools home-making is taught, some of them having full two-year courses. In most of them the work of the school is on a commercial basis, that is, the work is sold, either at cost to the girls themselves, or to any one who cares to buy, and the proceeds used to purchase more material. At some of them orders are received for work, which gives the student an opportunity of handling real trade problems, and furnishes materials which would be too expensive to supply for training work.

Vocational courses for girls within the high schools are maintained in many of the larger cities. As might be expected, sewing, dressmaking, and millinery form by far the larger part of the courses. A survey of Manual, Domestic, and Vocational Training in the United States, made by the Department of Practical Arts of the public schools of Reading, Pennsylvania, in 1914, found that in 147 cities the following subjects were taught in the high schools with a distinctly vocational aim: Cooking, 98; dressmaking, 92; sew-

ing, 89; home economics, 72; millinery, 71; nursing, 24; costume designing, 4; dietetics, 1; food preparation, 1; house decoration, 1; laundering, 1. Presumably in all these courses related academic work is required also.

Cincinnati offers a vocational music course, which leads to graduation, and also gives piano instruction in the high schools. A great many girls elect these courses. This city also has a technical coöperative course for girls, four years in length. We quote from the last annual report: "At the beginning of the third year the girl elects to take trade work in either dressmaking or millinery, and the coöperative program is put into operation. She spends one week in trade shop or establishment and one week in school. Two girls form a team, and occupy one position in alternate weeks. This coöperative work is carried on for two years."

V. Continuation Schools

Continuation schools are planned primarily for the benefit of youths who have left school to work before the completion of their education, and take different forms in different communities. In Cincinnati, where the State law requires all girls to remain in the regular day school until their sixteenth birthday, industrial classes have been formed to take care of the girls who were thus forced back to school after having been at work, while both elementary and high night schools are maintained, which offer courses for girls and women in sewing, dressmaking, millinery, embroidery, and cooking. A unique feature of the high school is the supper-cooking class, consisting of about 40 girls who two evenings a week go directly from their places of employment to Woodward High School where they receive instruction in cooking and immediately apply it in cooking and serving their own suppers. At 7:30 they leave the Domestic Science Department to attend their regular classes in academic and commercial subjects. Classes for women are formed in any school district where 20 or more women make application for a definite line of instruction. The enrollment in these classes reached over 2,000 in 1914.

Continuation schools were established under the law of 1913 in Massachusetts in September, 1914. The pupil must spend at least four hours a week in school, and may be required to spend more. This law is aimed primarily to reach all the workers of the age group 14 to 16. In 1913-14, 19 Massachusetts cities had evening schools of homemaking, in which practically all the students were girls and women who are employed during the day. These schools, though not

classed under the law as continuation schools, are such according to the terms of our definition.

New York City opened an experimental continuation trade class, composed of 16 white-goods workers, in 1914. Four girls were selected from each of four prominent business establishments. The girls attended the class on alternate weeks in groups of eight. A written report stating absences and character of work was submitted to the employer on Friday afternoon. The wages for the week was based upon this report, deduction being made for absence as in the shop.

Continuation schools somewhat upon the European plan constitute a very new development in public education in this country, but one which will doubtless continue, as they seem to offer a solution of the problem of education for those young people who are obliged to support themselves before they have acquired sufficient knowledge or training to make them desirable citizens of a democracy.

Summary

The foregoing bird's eye view of the present situation has served to put before us in a concrete way some features of the attempt to adjust our public secondary education to the needs of girls. We may summarize them briefly here.

I. Segregation is still practiced in a few of the eastern cities, with an occasional high school for girls in the south and west. These schools are in a favorable position to try out new ideas, and many of them are putting into practice new methods or courses looking toward a better adjustment of their work to meet the needs of their pupils.

Segregation within the high school is practiced here and there, chiefly in the first two years of the course, usually for the purpose of the better adaptation of certain subjects to the needs of the sexes. Where it has been or is being tried both teachers and pupils favor it as a rule.

II. The subject of home economics or some form of domestic science or art has had a great development within the last few years. Almost three-fourths of the States now recognize training for the home as a part of the function of the State in education, and considerably over half them supply aid to maintain home economics courses in the secondary schools.

III. The Homecraft School, which has developed in a few of our large cities, is essentially the settlement house idea applied to the public schools. The primary idea of these schools is that the best place to give a knowledge of homecraft or housecraft is in a real home, and the school is therefore in

a house conducted like any other well ordered home. Such schools are few as yet, but wherever found they are usually flourishing.

IV. Commercial education continues to attract large numbers of girls. Trade and industrial education is receiving much attention in the industrial centers, and at least two States, New York and Massachusetts, have specialists in vocational education for girls. Trade schools supported wholly or in part by the State have been organized in several cities, and in others some form of vocational training is being attempted in the high school.

V. Continuation schools making special provisions for girls have appeared in a few places. These schools reach a class that apparently can be reached by no other means, the girls of the age group 14-16 who are forced into work by reason of economic pressure and who have not, for one reason or another, previously obtained sufficient knowledge or training to make them efficient workers or desirable citizens.

Out of these attempts at readjustment, and of others with a like purpose in view, will come, it is to be hoped, a truer understanding of the girl herself, and a better knowledge of ways and means by which the school may be enabled to reach "all the children of all the people."

SOME SUGGESTIONS RELATIVE TO A STUDY OF THE MENTAL ATTITUDE OF THE NEGRO

Nietzsche is responsible for saying—

"The known, that is to say, what we are accustomed to, so that we no longer marvel at it, the commonplace, any kind of rule to which we are habituated, all and everything in which we know ourselves to be at home—what? is not our need of knowing just this need of the known? the will to discover in everything strange, unusual or questionable, something which no longer disquiets us?

"For what is known is understood, they are unanimous as to that. Even the most circumspect among them think that the known is at least more easily understood than the strange; that, for example, it is methodically ordered to proceed outward from the inner world, from the facts of consciousness because it is the world which is better known to us. Error of errors! The known is the accustomed, and the accustomed is the most difficult of all to understand, that is to say, to perceive as a problem, to perceive as strange, distant, outside of us."

It is doubtless this fallacy of the human mind which makes life in a democracy so difficult. For every little Philistine from any cross-roads station or any traditional vantage point, feels himself quite competent to settle any and all questions which happen to swim within his vision. One by one he takes up national problems, settles them in an offhand way, chiefly according to the predisposition and prejudice of the locality which has the honor to claim his birth. The basis for such conclusions is chiefly sentimentality, augmented by habits of thought ingrained in him from childhood. Happy is the day for the state when any pressing problem is raised above such a quagmire of undifferentiated emotions to the level of impersonal reasoning. Then the interested on-looker may hope for some valid solution of even the most vexing problem.

There is every indication that our so-called race question in the south is rapidly reaching this level. In various parts of the country, both north and south, men and women, trained in methods of scientific investigation, are bending their efforts to make the problem clear and to offer such solutions as may seem fit.

This scientific approach to the problem raises at once a feeling of confidence and security; it suggests an impersonal, dispassionate investigation. But alas! even scientists have their weaknesses; even they are prone to reach the conclusion contained in their hypothesis; to find what they set out to seek. Such is the danger of the present study of the negro race, and since the fate of a whole race hangs, as it were, in the balance, there is need of calling attention to certain fallacies which may arise or which have arisen; of stressing the need for extreme caution in methods of investigations and in the drawing of conclusions.

Especially is this true of any study of the psychology of the negro. This subject is such a delicate one, there are so many rocks of tradition and prejudice to shipwreck on; there are so many chances to be wrong with the best intentions to be right, that one could almost wish that the field were yet untrodden. However, since some have started such investigations, it may be well to point out a few of the quicksands and many a *cul de sac* into which even a well-disposed experimenter may go astray.

For example, who is a negro? Quickly the man in the street answers, "Anyone who is not a Caucasian," and is satisfied. But it seems hardly reasonable that such a loose definition should satisfy a scientist. Some more accurate definition should be formulated as a preliminary step in our drawing of conclusions. Do we mean by the term one who has no white blood in his veins, a pure African? or, if we allow some white blood, how much, one half, one quarter, one eighth? In a recent investigation of insanity among the race, the question was waived aside as of little moment. Yet, it seems important, since allowance is made for difference of characteristics in other blood mixtures. Even where two races as similar as the Scotch and the Irish mix, the product is different from either a Scot or an Irishman. It seems plausible that there should be some difference between an octoroon, say, and a full-blooded negro. But what? Only study can determine that, studies which might at the same time define "the negro."

When we know what a negro is, we might well go on to a study of inter-racial conditions; the effect of environment on the race, for example. For it would be a bold individual who would assert to-day, in the face of the feminist movement, that race and heredity account for all the characteristics of an individual, that environment counts for nothing. There are few of us who would limit our intellectual attainments, mediocre as they may be, to race or to heredity. Rather we are

eager to show that those to whom much has been given have much to give in return. What would become of the speech of the graduation orator if he could not tell the sweet girl graduates that society has a right to expect much from them since so much has been given them?

In the face of such recollections one cannot avoid the issue, what difference has environment made in the mentality of the negro? Is there any difference in the psychology of negroes who are descended from three or four generations of educated people and who have had the advantage of the environments produced by such ancestry, and the mental attitude of those whose parents and grandparents can neither read nor write? Does a difference exist between colored people who have been brought up in a hopeless conservative and class-conscious atmosphere and those who have been raised in a stimulating environment? Is there any difference in the mental attitude of the young men who have been forced out into the world and that of the young women who are kept close at home?

These are some of the most obvious questions which seem crying for solution, questions concerning the race itself which should be determined before any comparison is made between this race and the white race. For we must have some fixed standards of comparison, if our conclusions are to be trustworthy. Even so, our task must needs be a difficult one, for where are we to find a negro and a white child who have had even approximately the same environment, one a member of the ruling race, the other kept in subjection?

Suppose an investigation be undertaken between children of these two races; what test is to be used? At the present time there is grave criticism of the Binet test, as the supplementary tests offered in its place testify. Some psychologists question all tests now being used and are skeptical of the scientific value of any results gained by them. In the face of such a situation, it seems really too bad to wax dogmatic about any individual and particularly serious when the mental status of a whole race is involved. Yet the Washington *Post* asserted flatly that a scientist, at a recent scientific gathering, had asserted that the negro race tested three years below the white race. The *Post* is not infallible; it may have misquoted the paper but the public got an impression which will be far-reaching in its damaging effects. Why not wait until some less fallible test is devised?

However, the most serious objection to the present methods of investigation is based on the fact that white people conduct the investigation; especially is there danger if the inves-

tigator is a stranger. In fact, it is not too much to say that the mere presence in the room of a member of the dominant race creates an atmosphere in which it is impossible to get a normal response. It matters not how friendly the white person may be, there are certain mental attitudes so ingrained in negroes that disinterested friendliness cannot be recognized. These attitudes are so automatic in their action that they may be said to be instinctive.

Chief among these is the determination, on the part of the negro, not to let a white person know anything about him. He has been told so often that he is different; a problem; nay, even that he is repulsive to white folks, that he has developed sensitiveness as his protective coloring. He is determined not to allow the white race to know him for fear they will call him queer. Therefore, it is quite impossible for a stranger to get at the reaction of even little children of the colored race. There is a barrier erected as a shield and only years of patient, honest endeavor can enable one to get behind it.

Also any race or sex whose welfare and happiness depends upon the good-will of the stronger element in the community becomes very proficient in interpreting the moods of the overlord and in devising ways and means to placate him. It is soon learned that to please is to follow the line of least resistance. This ability was of so much value during slavery that the chances are that those who practiced it survived; even to-day it has become second-nature for the colored child to do and to say the pleasing thing. Therefore, in any test conducted by a white person, the child's mind is centered on doing or saying the pleasing thing rather than on an endeavor to get correct results. He has only a remote interest in making the right reaction, while his interest in the approbation of the lady is immediate and intense. This is so universally true that any examination conducted under these conditions can be little more than a test of good-will; beyond this, I doubt if it has any value.

Another limitation in investigations of the negro by the white race is that of unconscious mental bias. Our imagination has been fed on sentimental tales of ante-bellum days, on the hair-raising stories of reconstruction, on newspaper exploitations of sensational crimes; we so rarely meet any of the really intelligent, far-sighted negroes, that, unconsciously, we have certain preconceived notions of what the negro is. Under such circumstances it is almost impossible to get a just result; we find what we are looking for. Especially is this true in cases where interpretation is necessary, interpretation being largely a matter of personal bias. Therefore,

my own belief is that it is quite impossible for the white race to make satisfactory and fair studies of negro psychology. Our limitations of race and breeding are too great, and the attitude of the negro toward us is such that we are likely to do harm rather than good by treading in such delicate paths. Let us confine our endeavors to the less personal sciences of hygiene and sanitation, sociology and economics, leaving the delicate manipulation of psychology to the negro himself.

However, even so, there is serious question whether any trustworthy scientific data can be collected. When so much is at stake for the negro, when his own personal standing, as well as that of his race, is in question, the temptation would be great to err on the side of too favorable interpretations. The negro, too, has his personal bias and would naturally make allowances and suggest mitigating circumstances which might not appear quite just. He, like the white scientist, might seek to prove his hypothesis. Hence the much needed study of the mental attitude of the negro seems doomed to failure since it falls between the two horns of this dilemma. Perhaps a legitimate solution might be to have such investigations worked out by a negro and a white scientist working together. Each could supply what the other lacked; each could be a check on the conclusions of the other. In some such way, much interesting and valuable data might be procured, and much injustice toward another race might be avoided.

A STATISTICAL STUDY OF THE DISTRIBUTION OF COLLEGE GRADES

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In the majority of colleges, the method of assigning grades to students' work in order to secure a fairly uniform standard in the various departments is confined to collecting in the central office the grades given in the different courses. The results thus obtained may be investigated and compared by those members of the faculty wishing to do so, or may be called to the attention of certain instructors when it seems advisable that their system of grading should be modified.

The assumption would seem to be that, with this slight check on the extremes of grading, the marks of the various departments and of the various instructors in the departments, are of equal value; that is, the grade of E from any member of department A is equivalent to an E given by any member of departments C, D, E, etc., that is

$$E_A = E_B = E_C = E_D = \text{etc.}$$

Whether this is true in a typical institution, it is the aim of this paper to investigate.

The study is based on the records of students of the Freshman classes of the years 1910-11, 1911-12, 1912-13, 1913-14, in the College for Women, Western Reserve University. It deals with Freshmen because many of the subjects studied during the first year are compulsory and on that account the principle of selection does not operate. Whereas in the higher electives where the personnel of the class is to a certain extent determined by preference, a greater percentage of the higher grades would naturally be expected than in the large unselected groups following a prescribed course; in these latter classes one might reasonably expect a normal distribution of ability.

The number of grades given by each instructor in each department for each of the four years was counted and this material arranged so as to give:—

1. The percentage distribution of grades by departments.
2. The percentage distribution of grades by different instructors in the different departments.

3. The percentage distribution of grades by years, enabling a comparison to be made of the four classes with regard to their power of gaining the grades of E and G.

In the case of each subject, percentages have been reckoned on the basis of the total number of marks given in that subject, so that where the work covered two semesters, as it did in some departments, one individual has received two marks. The total number of grades assigned, on which the percentages are based, is recorded in each case.

Distribution of Grades by Departments

Table I shows the percentages of grades in each department taken as a whole, over a period of four years, on the basis of the total number of marks given in that department.

Table I

Department	Percentages Receiving Grades of						Number of grades awarded
	E	G	F	P	D	X	
A	13.6	32.2	39.4	10.8	2.4	1.6	242
B	5.6	30.8	42.0	12.3	4.8	4.5	772
C	11.7	43.6	30.0	9.0	5.6	0.1	427
D	25.2	36.0	24.6	10.7	2.8	0.7	690
E	13.3	47.4	16.9	13.2	6.2	3.0	781
F	8.8	24.7	30.7	25.2	7.4	3.2	215
Ideal distribution	5	20	50	20	5		

The wide divergences of the various departments both from one another and from the ideal distribution which is discussed later, and which is recorded at the bottom of the table, are apparent.

The natural conclusions would be, *a*, that the grade of E varied in value among the various departments; or *b*, that the instruction was so much better in some departments as to carry a larger number of students into the higher grades; or *c*, that the mental ability necessary in the different subjects was distributed unevenly in the classes. This last hypothesis can be dismissed at once; the second supposition will later be shown to be extremely unlikely, which leaves as the only

feasible explanation for the differences in the grading of the various departments, the fact that the grade E in one department bears little if any relation to an E given in any other

TABLE II

Department	Instructor	Years	Percentages Receiving Grades of						Number of grades awarded
			E	G	F	P	D	X	
A	a	1910-11	8.7	19.6	45.7	21.8	2.1	2.1	46
	b	1911-14	16.0	32.7	38.1	8.0	3.4	1.8	113
	c	1913-14	14.8	32.4	44.0	5.9	0	2.9	34
	d	1911-13	12.2	42.9	32.7	10.2	2.0	0	49
B	a	1910-14	8.5	34.5	34.5	14.0	3.6	4.9	165
	b	1910-12	2.7	33.2	42.0	12.4	5.4	4.3	186
	c	1912-14	4.1	29.4	44.2	14.3	3.3	4.7	147
	d	1912-14	14.3	7.7	59.1	6.7	5.6	6.6	91
	e	1912-13	4.7	37.2	41.8	11.6	4.7	0	43
	f	1910-14	2.9	36.2	38.0	12.2	6.4	4.3	140
C	a	1910-14	7.7	44.4	36.4	6.4	5.0	0.1	143
	b	1910-14	13.7	43.5	26.6	10.2	6.0	0	284
D	a	1910-14	28.6	39.7	21.4	8.5	1.4	0.8	494
	b	1910-13	14.6	26.1	38.2	11.4	8.9	0.8	123
	c	1912-14	20.5	27.4	24.6	26.1	1.4	0	73
E	a	1910-14	12.3	43.8	17.4	14.1	7.6	4.8	397
	b	1910-14	11.9	51.0	17.2	12.9	5.5	1.5	326
	c	1912-13	27.6	51.7	12.1	8.6	0	0	58
F	a	1910-14	8.8	24.7	30.7	25.2	7.4	3.2	215
Ideal distribution.....			5	20	50	20	5		

department. That is, we may say at once that the equation of identity

$$E_A = E_B = E_C = E_D = \text{etc.}$$

does not hold even approximately.

Distribution of Grades by Different Instructors in Different Departments

In Table II the percentages of the grades given by different instructors in each department are presented. The percentages were reckoned on the basis of the total number of grades given by each instructor for the four years, or whatever portion of the four years that instructor was present in the department. The general reliability of the percentages as representing an average distribution, is indicated by the total number of grades assigned.

From these tables it will be seen that different instructors even in the same department, dealing with students of the same mental calibre, do not agree in their system of marking; for in extreme cases over a period of several years, a particular instructor will give 400 per cent. more E's than another instructor in the same department. This can be due to no other cause than a difference in a standard which is purely subjective; it is not a tenable position that such a situation can arise merely from a difference of pedagogical skill. In fact the experience of many would lead to the view that in general, the better the teacher, the lower the system of the grading.

Distribution of Grades by Years in the Departments

Table III shows the percentages of grades given in each department taken as a whole, in the separate years.

Table III

Department	1910-11						1911-12						1912-13						1913-14					
	Percentages Receiving Grades of																							
	E	G	F	P	D	X	E	G	F	P	D	X	E	G	F	P	D	X	E	G	F	P	D	X
A	9	19	46	22	2	2	15	28	45	6	3	3	14	35	28	22	1	0	12	40	35	10	3	0
B	2	41	31	15	7	4	4	33	41	12	5	5	6	32	40	14	4	4	8	42	37	5	4	4
C	11	37	37	7	8	0	14	50	22	9	5	0	11	34	34	13	8	0	9	51	29	7	3	1
D	20	36	27	10	4	3	28	40	22	7	2	1	21	37	23	15	4	0	30	30	27	12	1	0
E	14	41	21	15	6	3	11	48	13	17	8	3	16	52	14	10	4	4	12	47	21	12	6	2
F	2	18	37	39	0	4	7	16	34	31	12	0	11	29	27	22	11	0	14	36	25	11	5	9

It is interesting to note whether there was any unanimity of opinion among the departments as to the abilities of the various classes, as indicated by the relative number of high marks. This point can be investigated by a direct examination of the data, but the conclusions are shown more clearly by means of Table IV, which is constructed on the following basis:—the Freshman class which received from any particular department the highest percentages of the grades E and G, is given the rank of 1, the class with the next highest percentage the rank 2 and so on for the four classes. Thus the Freshman class of 1913-14 was awarded a larger percentage of the grades E and G than any of the three preceding classes, except in a single department where it was beaten by the class

TABLE IV

Classes arranged in rank order with respect to power of gaining grades E and G in each department; 1 = best class, 4 = worst class

Department	1910-11	1911-12	1912-13	1913-14
A	4	3	2	1
B	2	4	3	1
C	3	2	4	1
D	4	1	3	2
E	4	3	2	1
F	4	3	2	1

of 1911-12. This may be due to a tendency to give an increasingly large number of higher grades for identical work, but it is more likely to be due to a superiority of work on the part of the Freshman class of 1913-14. If this latter hypothesis is true, it would seem to indicate that the grades given by the various departments do relatively from year to year, give an indication within that department of the excellence of the class.

CONCLUSIONS

An examination of the tables reveals the great differences in the distribution of the grades in the various departments. These differences can be accounted for only by assuming that there is great disagreement as to what standard of work is represented by a particular grade. Even in the same department different instructors, dealing with similar classes, fail to grade on a common basis.

Obviously as long as the present system continues, which admits of such great variability, there can be no safeguard against too easy or too severe marking. Two possible methods of producing increased uniformity are now in use:

1. The publication of the grade statistics showing the extent to which there is a reasonably uniform standard.
2. The employment of a uniform system of grading based on the assumption of the normal distribution of ability, in large classes over a period of several years.

The first method is effective to a certain degree; by its means any flagrant injustice is prevented, for an individual member of the faculty is informed if his distribution of grades varies considerably from that of the rest of the faculty.

The second method of obtaining uniformity is now in use in a number of the institutions of the country, among which number are:—Harvard, Yale, Michigan, Missouri, etc.* This method assumes, when dealing with large classes, where there is no principle of selection in operation, that the abilities of the members of the class vary according to the normal law of distribution, which is represented by the curve of which the equation is given:—

$$y = \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{-x^2}{2\sigma^2}}$$

Every statistical study of the ability of college students would suggest that it is not unreasonable to assume such an approximate distribution of ability. If this is the case, the most obvious method of assigning grades would be as shown below:

E	G	F	P	D and X
5	20	50	20	5

This method has in fact been adopted, with slight modifications by the institutions named.

It may appear that such a method leaves little liberty to the individual instructor, fixed as it is by arithmetical consideration. Herein lies its excellence, for when large classes free from selection are under consideration, it may be sup-

* Uniformity of Grading in Colleges and Universities, by R. C. Brooks, *School and Society*, Vol. I, No. I, pp. 32-35.

posed that the class average forms a better estimate for marking than the variable and often chance standard of a particular instructor. It should be observed that this method of marking does not apply to small selected classes, but it may be noted that a correct standard deduced from the large elementary classes, by statistical methods, is the best guarantee of a reasonable scale of marking in the more advanced classes.

The question of college grading admits of long and often heated argument; great differences in the standards of departments produce discontent in the student body; so much so that at times, to anyone who is apt to think quantitatively, the whole system seems chaotic, and the only solution would appear to be to discontinue grades, and rely on percentages which do not admit of such ready comparison from department to department. If colleges insist on some method of mark grading, and for many reasons it is desirable to give such grades, the following course should be adopted. Each department that has to deal with large groups should be informed that, unless there is great reason to the contrary, the distribution of grades, over a period of one or more years, must fall within certain limits. These limits would be determined partly by the ideal distribution curve, and partly by the grading system in vogue.

Where the classes are small, and selection and elimination have operated, another course may be adopted with a view to obtaining more uniformity of grading. When the constitution of each class is determined, the office of the college inquires into the previous grades of each member of this class, and sends to the instructor, with no individual names, the distribution of grades of these students based on past records. Thus in a class of ten, if the instructor is informed of the numbers of individuals who, on their total previous record, have obtained the grades:—E, G, F, etc., respectively, he is in a position to know the type of class he is receiving, which gives the surest basis for a sound relative system of marking. If the grades given to these small classes, over a period of time, do not approximately correlate with the average of the grades received previously, there is strong evidence in favor of the assumption that the grading of that instructor is not comparable with what may be called the "mean college grading."

THE LANGUAGE STATUS OF THREE CHILDREN AT THE SAME AGES

By W. G. Bateman, University of Montana

Although, in various publications, information in growing quantity has been published about the language development of the individual child, little appears to be available regarding groups of children. Usually each author observes only one subject who is, in most cases, an only child. This leads to the exclusion of certain factors such as individual differences, the influence of children upon one another, the reaction to different environments, etc. Holden (11) listed the words used by his two daughters at the same age; W. and C. Stern (19) have published an interesting volume on some phases of language development using their three children as subjects; Gale (8) has recorded the vocabularies with some comments on three children of the same family; Bateman (1-2-3) is noting the various steps in the acquisition of speech by his two children, but these seem to exhaust the references. This paper discusses the ability in talking gained by three children from birth to twenty-eight months, the subjects being the author's two daughters and niece.

Some of the data have already been published (1) but will be used here for comparison. In two other articles (2-3) will be found more extended information regarding two of the children.

Biographical.

Jane and Anne were 28 months old on July 14, 1913, and March 28, 1915, respectively. Both are large, active and healthy, having a record of almost perfect health. At the above age by the Binet scale Jane ranked 3.5 and Anne 3. Racially their inheritance is rather mixed in a composition of English, Welsh, Dutch and German, the first predominating. Both parents are college graduates and teachers. Up to the time these observations were taken no particular efforts were taken along the lines of language development. The parents, however, endeavored to speak distinctly and correctly, encouraged all attempts by the children in this direction and discouraged "baby-talk."

Daphne Ada Wyman, first cousin of the above, was born

at Racine, Wisconsin, May 23, 1913. She is a large, sturdy child having had practically no ailments since birth. She has lived in California since 3 months old almost continuously with her parents although on a few occasions it was necessary for her to live with friends for a time. These absences from home loosened considerably discipline and training. Both her parents hold college diplomas. The one has been a teacher, the other is a Boys' Director in the Young Men's Christian Association. Her father is of German-English descent and the mother of English-Welsh. She received no particular training in speech; some points in this connection will be brought out later. At 28 months her responses to the Binet tests gave her a rank of 3.

Thus the general inheritance and environment of the three children are the same. Physically they resemble each other, showing their relationship more or less plainly. In general mental ability at 28 months they were on a par except that each child had some traits not shown by the others in so marked a degree. For instance, Jane had considerable ability in observation and concentration and a marked ability to do things with her hands; Anne had better general muscular control with consequent ease and abandonment of movement as well as decided mental alertness; Daphne had developed a sense of order quite uncommon since she knew the proper place for almost everything in the home and spent much energy in keeping it there. Temperamentally, on the other hand, all three were very different. Jane displayed the more calm and even disposition; Anne was more impulsive and at times tempestuous; Daphne more variable in mood and more emotional. All were (and are) strong-willed but while Jane was most cheerful under discipline and sought to gain her ends by more gentle methods, Anne did not accept discipline gracefully using persistence as her main reliance, and Daphne was more the rebel and fighter combating, ofttimes strenuously, what did not conform to her wishes. These differences in certain abilities and traits will be seen to have had an influence upon the language development in each case.

DATA.

The author's children were continuously under his observation and the cousin as well during five weeks of the twenty-seventh and twenty-eighth months. Other data concerning the latter were furnished by her mother. The vocabularies were obtained by writing down a large part of each child's conversation during two weeks, every effort being made to have the list complete. None of the children was conscious of the close scrutiny.

STATUS AT TWELVE MONTHS.

Time of First Word. All three children used the first word with definite meaning at about the same time—Jane at ten and one-half, Anne at ten and Daphne at eleven months. These words were 'hello,' 'daddy' and 'bye-bye,' respectively.

Babbling. This was practiced constantly by all three children, most so by Anne and least so by Daphne, but only Jane and her sister found enjoyment in stringing together long series of similar sounds such as 'uggle-guggle-wuggle.'

Vocabularies at Twelve Months.—Jane—10 words: Nouns—chow,* daddy, dog, pot, toast. Verbs—go, see. Adjectives—pretty, good. Interjection—hello.

Anne—9 words: Nouns—ball, chow, daddy. Verb—see. Adjective—dear. Adverbs—down, good-bye. Interjections—boo, hello.

Daphne—8 words: Nouns—chow, dada, dog, mama, pot. Pronominal—what's-that (always used together). Interjections—bye-bye, oh.

Comparison. The following table gives information about the vocabularies of one-year-old English speaking children.

TABLE I

Authority	Ref.	No. of words	Nouns	Verbs	Adjs.	Advs.	Interjs.
Hall.....	10	24	19	2	0	0	3
Mickens.....	13	3	2	0	0	0	1
Moore.....	14	6	6	0	0	0	0
Pelsma.....	17	10	7	1	0	1	0
Tracy.....	20	10	6	0	2	2	0
"	20	8	7	0	0	1	0
Bohn.....	5	7	7	0	0	0	0
Grant.....	9	3	2	0	0	1	0

The average number of words is 9; if the highest and lowest are left out, the average of those remaining is 8. The three children, then, used not only about the same number of words but this close to the average.

The composition of the three lists, however, is quite different, as shown in the following table.

TABLE II

Subject	No. of words	Nouns	Verbs	Adjs.	Advs.	Interjs.	Pronom.
Jane.....	10	50%	20%	20%	....	10%	....
Anne.....	9	33%	11%	11%	23%	23%	....
Daphne....	8	62.5%	....	....	....	25%	12.5%

Thus Anne has the most varied vocabulary and Daphne the simplest. The pronominal expression, 'what's that,' used by the latter is quite rarely used by such young children, similar words not appearing in any of the above listed vocabularies.

* Chinese word used by the children to mean something to eat.

The lack of verbs in Daphne's list is in agreement with those of most other children and the use of adjectives by Jane and Anne rather unusual.

Enunciation. In using her ten words Jane spoke very clearly in a careful fashion and with an intonation quite unlike other babies. She found little trouble in imitating simple words which was rather an amusement.

Anne spoke with considerably less clearness, running the sounds together and especially broadening the vowel sounds. There was a decided tendency to clip the last sound from words, particularly the 'g' in 'ing.' She soon tried to correct this voluntarily. She spent much time in chattering and imitating.

Daphne pronounced three of her eight words correctly—bye-bye, mama, dada. Chow was 'dow,' oh became 'lo,' pot and dog lost the final sound and the expression, what's that, was 'washa.' Some of these will be noted again. While babbling a good deal she did not imitate as much as other children.

DEVELOPMENT FROM 12 TO 28 MONTHS.

Daphne. At twelve months Daphne was chattering in a lively fashion and using 8 words with definite and proper meaning. During the next six weeks this number was much increased but during the rest of the fourteenth month and all of the fifteenth fewer words were in use, not more than 20. She seemed to be doing all she could to simplify the language. Anything to eat or drink was 'good' with a long 'mm' after it. The phrase, 'what's that,' was never used, only 'that' accompanied by pointing for anything she wanted. The nouns themselves were seldom used. The foreign word 'chow' was lost in neglect as well. During this time she was more or less strenuously engaged in learning to walk. The whole period is a good example of the so-called "plateau" for after walking was accomplished there was a decided expansion in the language development. The most significant loss during the recovery was the failure of the desire to imitate. Whereas before the plateau stage she would repeat things she heard, this was rarely true afterwards. Little attention was paid to conversation around her, few pains were taken on her part to speak clearly and from a rather overuse of vocalistics she became, on the contrary, decidedly silent. These changes had a marked influence on her later status. The materials gained for self-expression, however, increased largely during this period.

The sentence form did not appear until the seventeenth

month when the simplest forms were first used. They have remained undeveloped due to the late or non-acquisition of some of the parts of speech. After the second year compound sentences were in use but a slight pause took the place of conjunctions. Six months elapsed between the use of the first word and the first sentence.

Anne. As shown above, Anne began her second year with a stock of nine words and as time went on rapidly acquired new terms. She imitated much that she heard about her and practiced certain words with much energy, seeming to realize that her methods of pronunciation were not quite the same as those of grown-ups.

Simple sentences were first used in the fifteenth month. By the twenty-fourth month all the parts of speech were in use, the conjunction coming only at the date mentioned. Before this a slight pause or repetition took the place of 'and.' At this time, then, the child began to make all types of sentences. Five months passed between the first word and first sentence.

Beginning in the nineteenth month and lasting about two months there was a marked change in the child's attitude toward talking. She no longer cared to imitate either spontaneously or by coaxing. Very few new words were learned and the greatest economy was practiced in sentence structure. The whole affair seemed a decided retrogression. However, Anne was as active and alert as ever in other directions. Physically, she was much engaged with dentition which was somewhat delayed. As soon as the molar teeth had erupted she suddenly began to chatter again, making very rapid progress, so that all the lost ground was easily recovered. New words were used literally by dozens. This rapid development after the so-called plateau stage has been noted by a number of others.

At two years Anne was using 407 words and had a maximum vocabulary of 497 which compared favorably with others published for children of this age (3). During the next four months she increased the number somewhat over 50 per cent., gained in ability to use the sentence form and improved markedly in enunciation.

Jane. After once beginning to talk Jane made consistent progress, not interrupting her course as did the other two. At fifteen months she was using 75 words, at eighteen months one hundred more and at two years about 300 were in use. Among the parts of speech, however, the conjunction was missing so that the more complex sentence forms were not possible. Following the practice of the others, Jane used slight pauses and repetition to take the place of connectives.

The sentence in its simplest form first came largely into use in the sixteenth month, and during the next six months was developed as far as the child's limited materials allowed. Five months intervened between the first word and first sentence.

But although Jane showed no well marked plateau stage two variations in method should be noted. During the three months from the fifteenth to the eighteenth she discontinued active imitation and declined to use two Chinese words which heretofore had been of as much service as others. However, she went right on talking and used new words which she learned by direct observation without practice. After the eighteenth month, however, when she had suddenly learned to walk, she began both imitation and the use of the tabooed foreign words. At the beginning of the twenty-fourth month the second phase of individual speech activity began. The child now took to speaking long strings of sounds well modulated and phrased but quite unintelligible although accompanied by many expressive inflections and turns of the voice. It soon appeared that she was anxious to really converse and to hold up her end of the conversation and indeed at a distance it sounded very well. She persisted in this imitation until by dint of acquiring many new words and ideas she was really able to make it serve her, which result was reached in about two months. Since that time she has been for a little child unusually direct and concise in her talk so that a few have termed her "an old-fashioned girl."

Comparison. In general during this interval Anne made the most rapid progress and Daphne somewhat the slowest. Some reasons for this will be discussed later.

While Jane did not pass through any well-defined plateau stage she did display more interest in language improvement after learning to walk. But Anne, like Daphne, went through a period of marked deterioration in speech activity but connected apparently with dentition rather than walking. Some authorities have thought such neglect of talking to be caused by diversion of energy to other channels.

Jane first used simple sentences in the sixteenth month, Anne in the fifteenth and Daphne in the seventeenth. From this beginning to complete and complex sentences took fourteen months for Jane, ten for Anne and was far from complete after ten to eleven in Daphne's case.

It is instructive to note the long time during which only single words were used, 5 months for the two sisters and 6 for the cousin. Stern considers this to show how well the single word sentence can suffice for the child's needs and that it does not emphasize the slowness of development. Some

children retain such simple usage for much longer periods, even 11 to 12 months (Drever, Major) in some cases.

The greatest difference among the children is seen to be in the spontaneous interest in speech activity shown respectively by the three youngsters.

STATUS AT 28 MONTHS.

The vocabularies were compiled according to the following rules: 1, no proper nouns; 2, no plurals unless the singulars were not used; 3, all forms of pronouns are included; 4, no variants of verbs or adjectives unless sometimes from different roots; 5, the same word may be listed more than once according to its grammatical use by the child; 6, only words used with at least some approximation to correct meaning are listed; 7, words deviating from usage are in quotation marks followed by an explanatory word in brackets; 8, words used in common by all three children are in italics.

JANE'S VOCABULARY AT 28 MONTHS

A. Nouns—*apple*, apron, *arm*.
Verb—am.
Adjectives—a, *all*, awake.
Adverbs—alright, around, *away*.
Preposition—about.
Interjection—ah.

B. Nouns—*back*, bacon, bag, *ball*, basket, *bath*, *bathroom*, *beans*, *bed*, beet, *bib*, *bird*, biscuit, bite, blanket, *block*, *book*, bone, *bottle*, bouquet, *box*, *bread*, broom, *brush*, bucket, buckle, *button*.
Verbs—bite, break, *brush*, build, *button*.
Adjectives—beautiful, *big*, *broken*.
Adverbs—back, better, backward.
Interjection—boo.

C. Nouns—cabinet, *cake*, *can*, *candy*, *car*, carrots, *cart*, cascara, *cat*, cellar, *chair*, chain, charcoal, *cheese*, cherries, chick, chocolate, chow, clock, closet, *clothes*, clothes-pin, coal, coal-shed, *coat*, *cocoa*, *coffee*, *comb*, cotton, cork, couch, crayon, cream, "crax" (crackers), cube, *cup*.
Verbs—*can*, can't, carry, clean, close, *come*, cook, cough, crawl, *cry*, cut.
Adjectives—chocolate, *clean*, cold, crooked.

D. Nouns—*daddy*, diaper, dinner, ditch, *dog*, doll, *door*, *dress*, *drink*, *duck*.
Verbs—*dance*, *do*, don't, draw, dress, drink, drop.
Adjectives—dear, *dirty*.
Adverb—*down*.
Interjection—darn.

E. Nouns—*ear*, *egg*, *enough*, *eye*.
Verbs—eat, excuse.

F. Nouns—face, feather, feet, *fire*, fish, *floor*, *flower*, *fly*, *fork*.
Verbs—*fall*, *feel*, fit, *fix*.
Adjectives—foolish, funny.

G. Nouns—*garter*, *girl*, glass, go-cart, "gran" (grandma), grass.
Verbs—*get*, *go*, gulp, gurgle.
Adjective—*good*.
Adverbs—good-bye, good-night.

H. Nouns—*hair*, *hand*, *handle*, "*hankie*" (handkerchief), *hat*, *head*, heel, *hole*, home, honey, *house*, *horse*.
Verbs—hang, *have*, hear, help, hit, hug, hurry, *hurt*.
Adjectives—heavy, high, *hot*, hurt.
Adverb—*here*.
Pronoun—him.
Interjection—hello.

I. Verb—is.
Pronouns—*I*, *it*.
Preposition—*in*.

J. Nouns—jacket, jar, jelly.
Verb—jump.
Adverb—just.

K. Nouns—*key*, *kiss*, *kitchen*, *knee*.
Verbs—keep, kick, *kiss*, knock.

L. Nouns—lawn, *leg*, lid, *light*, "lots".
Verbs—lay, laugh, lean, let, lie (recline), *like*, lock, *look*.
Adjectives—long, lost, lovely.
Adverb—lot.

M. Nouns—*macaroni*, *man*, *meat*, *milk*, *mother*, *moon*, mosquito, *mouth*, mouthful, mush.
Verbs—move, must.
Adverb—*more*.
Pronouns—*me*, *my*.

N. Nouns—"nakum" (napkin), *neck*, *needle*, nightshirt, *nose*.
Adjectives—nasty, naughty, *new*, nice.
Adverbs—*no*, *not*, now.

O. Verb—*open*.
Adjectives—*old*, *one*, other.
Adverbs—*off*, *on*, *out*, over.
Prepositions—of, *on*.
Interjections—*oh*, ouch.

P. Nouns—*pail*, pair, pan, *paper*, paste, *pease*, *pencil*, pie, *piece*, *pillow*, *pin*, *plate*, plenty, *plug*, *pocket*, *pot*, prunes, *pudding*, pup.
Verbs—pat, pick, *play*, *put*.
Adjectives—pink, precious, *pretty*.
Interjection—"plunk" (kerplunk).

R. Nouns—rabbit, rake, rattle, ribbon, *rice*, *rockingchair*, *rompers*, room, rubber.
Verbs—*rain*, rake, reach, rock, *run*.
Adjective—ready.
Adverb—right.

S. Nouns—*salt*, *salve*, *sandal*, school-side, *shirt*, *shoe*, *shovel*, *slipper*, *soap*, socks, sound, soup, *spoon*, stair, step, sticker, stove, strawberries, string, suei, chow, *sugar*.

Verbs—*say*, *see*, *sew*, *sit*, shall, *shut*, *sleep*, *smell*, *spank*, spill, splash, stand, step, sweep.
Adjectives—silly, soaking.
Adverbs—so, some.
Pronoun—she.

T. Nouns—*table*, table-cloth, taste, *tea*, *teeth*, things, *tie*, *toast*, *tongue*, town, train, tray, *tree*, trunk, *tub*.
Verbs—*take*, talk, tear, thank, tickle, tip, try, *turn*.
Adjectives—that, the, thin, this, thirsty, tin, tired, *two*.
Adverbs—*there*, *through*, *too*.
Pronouns—*that*, this.
Preposition—to.
Interjection—there.

U. Noun—*umbrella*.
Adverb—*up*.
Pronoun—us.

V. Nouns—vase, vaseline.

W. Nouns—walk, washrag, *water*, *wood*.
Verbs—wake, *walk*, *want*, *wash*, would.
Adjectives—warmer, *wet*, white, wrong.
Adverbs—"wayup," what, *where*.
Pronoun—*we*.
Interjections—whoa, whoop.

Y. Adverb—*yes*.
Pronouns—you, your.

The following table shows the number of words of each initial letter classified as to grammatical form, the total number of words beginning with each initial letter, and, finally, the total number of words in the above list:

TABLE III

Initial	Nouns	Verbs	Adjs.	Advs.	Prons.	Preps.	Interjs.	Total
C	36	11	4	0	0	0	0	51
S	21	14	2	2	1	0	0	40
B	27	5	3	3	0	0	1	39
T	15	8	8	3	2	1	1	38
H	12	8	4	1	1	0	1	27
P	19	4	3	0	0	0	1	27
D	10	7	2	1	0	0	1	21
W	4	5	4	3	1	0	2	19
L	5	8	3	1	0	0	0	17
R	9	5	1	1	0	0	0	16
F	9	4	2	0	0	0	0	15
M	10	2	0	1	2	0	0	15
G	6	4	1	2	0	0	0	13
A	3	1	3	3	0	1	1	12
N	5	0	4	3	0	0	0	12
O	0	1	3	4	0	2	2	12
K	4	4	0	0	0	0	0	8
E	4	2	0	0	0	0	0	6
J	3	1	0	1	0	0	0	5
I	0	1	0	0	2	1	0	4
U	1	0	0	1	1	0	0	3
Y	0	0	0	1	2	0	0	3
V	2	0	0	0	0	0	0	2
Q	0	0	0	0	0	0	0	0
X	0	0	0	0	0	0	0	0
Z	0	0	0	0	0	0	0	0
	205	95	47	31	12	5	10	405

Table IV shows the percentage each part of speech is of the total number of words.

TABLE IV

	Nouns	Verbs	Adjs.	Advs.	Prons.	Preps.	Interjs.	Total
Number..	205	95	47	31	12	5	10	405
Per cent..	50.62	23.46	11.60	7.65	2.96	1.24	2.47	100.00

The next table shows the number of words beginning with each initial sound (as contrasted in some cases with initial letter).

TABLE V

Sound	No. words	Sound	No. words	Sound	No. words
K	50	M	15	E	6
B	39	F	15	sh	6
S	34	W	14	J	5
P	27	G	13	wh	5
H	27	A	12	I	4
T	26	O	12	U	3
D	21	N	12	Y	3
L	17	th	12	V	2
R	16	ch	9		
					405

Proper Nouns.—Billie, Grand-ranch, Henry, Jane, Patsy, Percy, Puck, Roger, Rose, Sam, Squire.

If these were included in the vocabulary the total number of words would be 405 plus 11, or 416, of which the proper nouns would constitute 2.64 per cent.

Total number of words of all kinds:

In above list	405
Proper nouns	11
Inflections	72
	488

ANNE'S VOCABULARY AT 28 MONTHS

A. Nouns—accident, *apple*, apron, "aminal" (animal), anything, *arm*, ashes, automobile.
Verbs—am, ask.
Adjectives—a, *all*, awake, asleep.
Adverbs—again, alright, *away*.
Conjunction—and.

B. Nouns—baby, *back*, bacon, *ball*, banana, basket, *bath*, *bathroom*, bead, *beans*, bear, *bed*, bell, belt, bench, *bib*, *bird*, birthday, biscuit, *block*, bogie, bone, *book*, *bottle*, *box*, boy, *bread*, broom, *brush*, buckle, bug, bundle, butter, *button*.
Verbs—bang, back, bark, bite, bounce, break, bring, *brush*, buckle, build, bump, burn, *button*.
Adjectives—bad, *big*, black, blue, *broken*.
Interjections—bang, boo.

C. Nouns—*cake*, *can*, candle, *candy*, cap, *car*, carrot, *cart*, casserole, *cat*, ceiling, cellar, *chair*, chain, cheek, cherry, *cheese*, chicken, chin, chow, clock, closet, *clothes*, coal, coalbucket, *coat*, *cocoa*, *coffee*, coffeepot, *comb*, comfort, cookie, cork, corner, cotton, couch, cow, cracker, crumb, *cup*.
Verbs—*can*, can't, call, carry, catch, chew, choke, clean, climb, *come*, cook, cough, *cry*, cut.
Adjectives—*clean*, cold, cute.
Adverbs—careful, close.

D. Nouns—*daddy*, desk, dimple, diningroom, dinner, dirt, dish, ditch, *dog*, doll, dollie, *door*, doughnut, drawer, *dress*, dressing gown, *drink*, *duck*, duster.
Verbs—*dance*, *do*, don't, dress, drink, drop, dry.
Adjectives—*dirty*, dry, dizzy.
Adverb—*down*.

E. Nouns—*ear*, *egg*, elbow, elephant, *enough*, *eye*.
Verbs—eat, excuse.

F. Nouns—face, fat, feather, finger, fingernail, *fire*, fish, *floor*, *flower*, flour, flute, *fly*, foot, *fork*, frog, fun, furnace.
Verbs—*fall*, fasten, *feel*, fill, find, *fix*.
Adjectives—fine, full, funny.
Adverb—fast.
Preposition—for.

G. Nouns—*garter*, *girl*, glass, glove, goat, gocart, goop, grass, gravy.
Verbs—*get*, give, *go*, grunt, gulp.
Adjective—*good*.
Adverbs—good-bye, good-night.
Interjection—Gesundheit.

H. Nouns—*hair*, *hand*, *handle*, "*hankie*" (handkerchief), *hat*, *head*, *hole*, home, honey, hook, horn, *horse*, *house*.
Verbs—*have*, hang, hear, help, hiccough, hide, hold, hug, hurry, *hurt*.
Adjectives—heavy, high, *hot*, hungry.
Adverbs—hard, *here*.
Pronouns—he, her, herself, him, himself, his.
Interjection—hello.

I. Nouns—ice-cream, iron.
Verbs—is, isn't, iron.
Adverbs—in, indoors.
Pronouns—*I*, *it*.
Preposition—*in*.

J. Nouns—jar, jelly, joke, juice, junket.
Verb—jump.
Adverb—just.

K. Nouns—*key*, kettle, kiddie, *kitchen*, *kiss*, *knee*, knife.
Verbs—keep, kick, *kiss*, knock.
Adverb—kindof.

L. Nouns—lap, *leg*, leggins, lemon, letter, *light*, load.
Verbs—laugh, let, lick, lie (recline), *like*, listen, *look*, love.
Adjectives—last, little, long, lost.

M. Nouns—*macaroni*, *man*, mat, *meat*, *milk*, milkman, minute, *moon*, more, *mother*, *mouth*, mouse, mud, muff.
Verbs—make, meet, move, must.
Adverb—*more*.
Pronouns—*me*, mine, *my*.

N. Nouns—"nakum" (napkin), nail, *neck*, necklace, *needle*, night, nightgown, noise, noodles, *nose*, nut.
Verb—need.
Adjectives—nasty, naughty, *new*, nice.
Adverbs—nicely, next, *no*, *not*.

O. Noun—orange.
Verb—*open*.
Adjectives—*old*, *one*, orange, other.
Adverbs—*off*, *on*, *out*, outdoors.
Pronoun—one.
Prepositions—of, *on*, out, over.
Interjection—*oh*.

P. Nouns—*pail*, paint, pan, "pansweep" (dustpan), *paper*, part, party, path, *pease*, peach, *pencil*, pendant, penny, petticoat, piano, picnic, picture, pie, *piece*, pig, *pillow*, *pin*, place, *plate*, *plug*, *pocket*, pocket-book, poker, pomelo, porch, *pot*, potato, *pudding*
Verbs—parade, pat, pass, peel, pick, pinch, *play*, point, pour, pull, push, *put*.
Adjectives—pink, poor, *pretty*.
Adverbs—please, pretty.
Interjection—peek-a-boo.

Q. Adverb—quick.

R. Nouns—rabbit, rag, raisin, reins, ribbon, *rice*, ride, *rocking-chair*, *rompers*, room, rope, rubber, rug.
Verbs—*rain*, reach, read, remember, ride, rock, rub, *run*.
Adjectives—ready, real, right.

S. Nouns—*salt*, *salve*, sand, *sandal*, sandpile, sandwich, sauce, scalawag, schoolside, scissors, scratch, screwdriver, see-saw, shade, share, sheep, sheet, *shirt*, *shoe*, shoofly, shop, *shovel*, side, sister, skin, skum, *slipper*, sled, smack, smoke, snap, snow, *soap*, some, something, song, soup, spider, splinter, *spoon*, spring, step, stick, stocking, stone, story, stove, string, suei'chow, *sugar*, sun, sweater, swing.
Verbs—*say*, scratch, *see*, separate, serve, *sew*, shave, shine, *shut*, sing, *sit*, slap, *sleep*, *smell*, sneeze, *spank*, spit, splash, squeak, squeeze, stand, step, stop, sweep, swing.
Adjectives—sticky, still, sweet.
Adverbs—so, some, sometimes, still.
Pronouns—she, some.

T. Nouns—*table*, table cloth, tail, *tea*, tea party, teapot, *teeth*, thimble, things, thread, thumb, tick, *tie*, time, tit-bit, *toast*, tow, *tongue*, top, towel, tray, *tree*, trunk, *tub*, turkey, turn.
Verbs—*take*, talk, taste, tear, tell, thank, throw, tickle, tie, touch, try, *turn*.
Adjectives—that, the, these, thirsty, this, tired, *two*.
Adverbs—*there*, *through*, tonight, *too*.
Pronouns—*that*, this, these, they.
Preposition—to.
Interjection—there.

U. Nouns—"*umerbella*" (umbrella), underwear.
Verbs—undress, use.
Adverb—*up*.
Pronoun—us.
Preposition—under.

V. Noun—vaseline.

W. Nouns—wagon, wall, washrag, *water*, way, wheel, wheelbarrow, whiskers, wind, window, wire, *wood*.
Verbs—wait, wake, *walk*, *want*, *wash*, wheel, wiggle, will, wipe, won't, work, write.
Adjectives—warm, well, *wet*, white.
Adverbs—way, when, *where*, why.
Pronouns—*we*, what (inter), who.
Preposition—with.
Interjection—why.

Y. Nouns—yarn, yellowbell.
Adverbs—*yes*, yesterday.
Pronouns—you, yours, yourself.
Interjection—yes sir.

Table VI shows the number of words of each initial letter classified as to grammatical form, the total number of words beginning with each initial letter, the total of each part of speech, and finally the total number of words in the above list:

TABLE VI

Initial	Nouns	Verbs	Adjs.	Advs.	Prons.	Preps.	Conjs.	Interjs.	Total
S	53	25	3	4	2	0	0	0	87
C	40	14	3	2	0	0	0	0	59
T	26	12	7	4	4	1	0	1	55
B	34	13	5	0	0	0	0	2	54
P	33	12	3	2	0	0	0	1	51
W	12	12	4	4	3	1	0	1	37
H	13	10	4	2	6	0	0	1	36
D	19	7	3	1	0	0	0	0	30
F	17	6	3	1	0	1	0	0	28
R	13	8	3	0	0	0	0	0	24
M	14	4	0	1	3	0	0	0	22
N	11	1	4	4	0	0	0	0	20
L	7	8	4	0	0	0	0	0	19
A	8	2	4	3	0	0	1	0	18
G	9	5	1	2	0	0	0	1	18
O	1	1	4	4	1	4	0	1	16
K	7	4	0	1	0	0	0	0	12
I	2	3	0	2	2	1	0	0	10
E	6	2	0	0	0	0	0	0	8
Y	2	0	0	2	3	0	0	1	8
J	5	1	0	1	0	0	0	0	7
U	2	2	0	1	1	1	0	0	7
Q	0	0	0	1	0	0	0	0	1
V	1	0	0	0	0	0	0	0	1
	335	152	55	42	25	9	1	9	628

The next table gives the percentage each part of speech is of the total number of words.

TABLE VII

	Nouns	Verbs	Adjs.	Advs.	Prns.	Prps.	Cnjs.	Intjs.	Total
Number..	335	152	55	42	25	9	1	9	628
Per cent..	53.34	24.20	8.76	6.68	3.98	1.44	0.16	1.44	100.00

Table VIII shows the number of words beginning with each initial sound.

TABLE VIII

Sound	No. words	Sound	No. words	Sound	No. words
S	70	N	23	I	10
K	56	M	22	E	8
B	54	L	19	Y	8
P	51	A	18	J	7
T	37	G	18	U	7
H	36	th	18	sc	6
D	30	O	14	Q	1
F	28	sh	13	V	1
W	28	wh	11		
R	24	ch	10		628

Proper Nouns.—Billie, Catherine, Dickie, Doris, Fido, Grand-ranch, Gretchen, Isabel, Jack, Jane, Lewis, Logan, Louise, Lombard, Major, Marion, Percy, Rover, Salt Lake, Siebert, Smith, Underwood.

These 22 words if counted in the vocabulary would increase it to 650, of which they would constitute 3.38 per cent.

Total number of words of all kinds:

In above list	628
Proper nouns	22
Inflected forms	129
	779

DAPHNE'S VOCABULARY AT 28 MONTHS

A. Nouns—*apple*, *arm*, automobile.
Adjective—*all*.
Adverbs—again, almost, all, *away*.
Interjection—ah-ha.

B. Nouns—*back*, *ball*, *bath*, *bathroom*, bathtub, bead, *beans*, *bed*, bedroom, bee, beets, *bib*, *bird*, bite, *block*, *book*, *bottle*, bottom, *box*, boy, *bread*, *brush*, butter, *button*, buttonhook, bug.
Verbs—blow, *brush*, bump, *button*.
Adjectives—bad, *big*, blue, brandnew, *broken*.
Adverbs—better, big, bye-bye.

C. Nouns—*cake*, *can*, *candy*, canteloupe, *car*, *card*, *cart*, *cat*, *chair*, cheek, *cheese*, chick, *clothes*, clothespin, *coat*, *cocoa*, *coffee*, *comb*, corn, cow, cream, crumb, curl, curtain, cushion, custard, *cup*.
Verbs—*can*, catch, comb, *come*, cover, *cry*.
Adjective—*clean*.

D. Nouns—*daddy*, dirt, *dog*, dollie, *door*, drawer, *dress*, *drink*, *duck*.
Verbs—*dance*, dig, *do*.
Adjective—*dirty*.
Adverb—*down*.

E. Nouns—*ear*, *egg*, elbow, *enough*, *eye*.
Adjective—empty.

F. Nouns—fig, finger, fingernail, *fire*, fish-man, *flower*, *floor*, *fly*, *fork*.
Verbs—*fall*, *feel*, *fix*, fly.

G. Nouns—*garter*, *girl*.
Verbs—*get*, give, *go*.
Adjective—*good*.

H. Nouns—*hair*, *hand*, *handle*, "*hankie*" (handkerchief), *hat*, *head*, *hole*, *horse*, *house*.
Verbs—*have*, *hurt*.
Adjective—*hot*.
Adverb—*here*.

I. Nouns—ice-cream, ice-man.
Pronouns—*I*, *it*.
Preposition—*in*.

K. Nouns—*key*, *kiss*, *kitchen*, kitty, *knee*, knife, kodak.
Verb—*kiss*.

L. Nouns—lady, lady-bug, *leg*, letter, *light*, "lots".
Verbs—*like*, *look*, lose, love.
Adjective—little.

M. Nouns—*macaroni*, malted-milk, *man*, *meat*, *milk*, money, *moon*, more, *mother*, *mouth*, mud-pie, mush.
Verb—make.
Adverb—*more*.
Pronouns—*me*, *my*.

N. Nouns—*neck*, *needle*, night-gown, *nose*.
Adjective—*new*.
Adverbs—*no*, no-ma'am, *not*.

O. Nouns—oilcloth, orange.
Verb—*open*.
Adjectives—*old*, *one*.
Adverbs—*off*, *on*, *out*, outdoors.
Pronoun—our.
Preposition—*on*.
Interjection—*oh*.

P. Nouns—*pail*, *paper*, *pea*, peach, pear, *pencil*, petticoat, piano, picture, *piece*, *pillow*, *pin*, pinecone, *plate*, *plug*, *pocket*, pocket-book, *pot*, potatoes, *pudding*.
Verbs—*play*, pour, push, *put*.
Adjectives—poor, *pretty*.
Adverb—please.

Q. Noun—quilt.

R. Nouns—*rice*, ring, *rocking-chair*, *rompers*, rug.
Verbs—*rain*, read, *run*.

S. Nouns—*salt*, sand, *sandal*, *salve*, sardine, scissors, shaving-brush, *shirt*, sheet, *shoe*, *shovel*, *slipper*, *soap*, sock, spool, *spoon*, stomach, strawberry, *sugar*, sugar-bowl, suit-case, sweater, swim, swimming-pool.
Verbs—*say*, *see*, *sew*, shave, *shut*, sing, *sit*, *sleep*, *smell*, *spank*, spit, swim.
Adjective—sore.

T. Nouns—*table*, *tea*, tea-pot, teddy-bear, *teeth*, thread, thumb, *tie*, *toast*, toe, *tongue*, tooth-brush, tooth-paste, towel, *tree*, *tub*.
Verbs—*take*, *turn*.
Adjectives—tiny, *two*.
Adverbs—*there*, *through*, *too*.
Pronoun—*that*.

U. Nouns—*umbrella*, underwear.
Verb—unbutton.
Adverb—*up*.

W. Nouns—waist, watch, *water*, *wood*.
Verbs—*walk*, *want*, *wash*, wipe, write.
Adjective—*wet*.
Adverb—*where*.
Pronouns—*we*, what.

Y. Adverb—*yes*.

The following table shows the number of words of each initial letter classified as to grammatical form, the total number of words beginning with each initial letter, the total of each part of speech, and finally the total number of words in the above list.

TABLE IX

Initial	Nouns	Verbs	Adjs.	Advs.	Prons.	Preps.	Interjs.	Total
B	26	4	5	3	0	0	0	38
S	24	12	1	0	0	0	0	37
C	27	6	1	0	0	0	0	34
P	20	4	2	1	0	0	0	27
T	16	2	2	3	1	0	0	24
M	12	1	0	1	2	0	0	16
D	9	3	1	1	0	0	0	14
F	9	4	0	0	0	0	0	13
H	9	2	1	1	0	0	0	13
W	4	5	1	1	2	0	0	13
O	2	1	2	4	1	1	1	12
L	6	4	1	0	0	0	0	11
A	3	0	1	4	0	0	1	9
K	7	1	0	0	0	0	0	8
N	4	0	1	3	0	0	0	8
R	5	3	0	0	0	0	0	8
E	5	0	1	0	0	0	0	6
G	2	3	1	0	0	0	0	6
I	2	0	0	0	2	1	0	5
U	2	1	0	1	0	0	0	4
Q	1	0	0	0	0	0	0	1
Y	0	0	0	1	0	0	0	1
	195	56	21	24	8	2	2	308

Table X gives the percentage each part of speech is of the total number of words.

TABLE X

	Nouns	Verbs	Adjs.	Advs.	Prons.	Preps.	Interjs.	Total
Number..	195	56	21	24	8	2	2	308
Per cent..	63.31	18.18	6.81	7.79	2.59	0.65	0.65	100.00

Table XI shows the number of words beginning with each initial. Owing to faulty enunciation this differs considerably from Table IX.

TABLE XI

Sound	No. words	Sound	No. words	Sound	No. words
S	53	D	19	A	6
B	38	M	16	ch	4
L	35	W	14	G	2
K	31	F	12	sc	1
T	29	N	11	U	1
P	27	O	9		
					308

Proper Nouns.—Aunt Belle, Billie, Bill Veale, Daphne Ada, Dick-boy, Irene, Jane, Moore, Uncle Bill.

If these 9 words were included in the vocabulary the total would be increased to 317, of which these words would constitute 2.83 per cent.

In Table XII the figures for the three vocabularies are recapitulated for comparison.

TABLE XII

	Jane		Anne		Daphne	
	Number	Per cent	Number	Per cent	Number	Per cent
Nouns	205	50.62	335	53.34	195	63.31
Verbs	95	23.46	152	24.20	56	18.18
Adjectives	47	11.60	55	8.76	21	6.81
Adverbs	31	7.65	42	6.68	24	7.79
Pronouns	12	2.96	25	3.98	8	2.59
Prepositions	5	1.24	9	1.44	2	0.65
Conjunctions	0	0.00	1	0.16	0	0.00
Interjections	10	2.47	9	1.44	2	0.65
Total	405	100.00	628	100.00	308	100.00

DISCUSSION OF VOCABULARIES

For English speaking children of 28 months three vocabularies have previously been published. The data are shown in the next table.

TABLE XIII

	Tracy (20) Boy		Tracy, Girl		Drever (7) Boy	
	Number	Per cent	Number	Per cent	Number	Per cent
Nouns	422	62.33	287	63.63	176	51.00
Verbs	136	20.08	89	19.73	80	23.20
Adjectives	69	10.20	29	6.43	44	12.80
Adverbs	23	3.40	19	4.21	22	6.30
Pronouns	9	1.33	13	2.88	11	3.20
Prepositions	12	1.78	6	1.33	8	2.30
Conjunctions	2	0.30	1	0.23	2	0.60
Interjections	4	0.60	7	1.55	2	0.60
Total	677	100.00	451	100.00	345	100.00

Number of Words. The average of the three lists is 491. Since this contains proper nouns (Tracy and Drever) and inflected forms (Tracy) it is to be compared with Jane's maximum of 488, Anne's of 779 and Daphne's of 317. The average number of words at two years (20 vocabularies) is 498; at three years (9 vocabularies) 1,515. The average number of words in the six vocabularies at 28 months is 469. Some reasons for the variations in the number of words used by the subjects of this paper will be discussed later.

The vocabularies cited above and the three given in this paper are those of English speaking children of whom five are American. It is interesting to compare them with the vocabulary of a German boy (19) of the same age which amounted to 310-320 words distributed as follows: Nouns 61.5%, verbs 15%, adjectives 8%, adverbs 5.5%, other parts of speech including articles and numerals 10%. The list includes proper nouns.

Table XIV gives the averages for the six English speaking children.

TABLE XIV

	Nouns	Verbs	Adjs.	Advs.	Prns.	Prps.	Cnjs.	Intjs.	Total
Number..	269	100	46	28	13	7	1	5	469
Per cent..	57.37	21.47	9.43	6.00	2.82	1.43	0.24	1.22	100.00

The four girls average 448 words and the two boys 511.

PARTS OF SPEECH

Nouns and Verbs. Tracy (20) and Pelsma (17) have shown that the average per cent. of nouns in children's speech up to four years of age is about 60 and of verbs about 20. Jane and Anne therefore use less of the former and more of the latter than most children; indeed Anne's excess of verbs is rather unusual. Daphne's deviations from the average are in the opposite direction since her percentage of nouns is above and that of the verbs below. All three children use a greater proportion of verbs than are to be found in the dictionary and probably greater than are in use by adults. The German boy used less verbs and more nouns than the American and English children, but this appears not true in general of German children.

Anne and Jane at this age readily formed present participles from verbs as fast as the latter were learned. Such forms were even made spontaneously from nouns, such as "pianoing." In Daphne's case it was impossible to tell whether she could do this or not, for since she rarely enunciated the last syllable of her words the 'ing' sound was never heard. Neither did she use the past tense; all her talking was done

in the present form although it was clear that she knew she was describing past events. The other two children did use many past tense forms, especially Anne, but they had considerable difficulty with irregular forms so that 'seed,' 'felled,' 'falled,' 'runned,' etc., were common in their speech.

A point of special interest to be noted is the comparative lack in all three vocabularies of the auxiliary verbs. In Daphne's list certain forms of the copula are also wanting.

Adjectives. Jane made a larger use of adjectives than her sister or cousin. The two former began the use of this part of speech in the twelfth month with 'good' and 'dear' respectively. These were used more imitatively than otherwise, and the word 'hot' really begins the list of adjectives in the thirteenth month. A month later this same word was the first adjective used by Daphne. Even at twenty-eight months, however, she did not use the opposite 'cold' which had in the meantime come into use by her cousins. The delicate tissues of children are peculiarly sensitive to heat so that it is not surprising to find that 'hot' was one of the most used words being even over-worked as judged by the parents. Later 'big' was much favored by all three children. Few words referring specifically to sensations of taste, hearing, organic feelings and equilibrium and few connoting moral or abstract ideas are to be found in the lists. In all these respects these children are like the majority of their kind.

Adverbs. All three children show about the same percentage of adverbs in their repertoire of words, but Jane made most use of them. It is frequently stated that this part of speech appears after the nouns, verbs and adjectives (O'Shea, 16) which was true with Jane and Daphne but not with Anne, with whom adverbial function preceded adjectival. Pelsma (17) notes another exception, as does Moore (14).

Those adverbs denoting place appear first for while 'up' and 'down' are first used of the adverbs they appear to refer in the child's mind to the place rather than to the action. Furthermore 'here' appears in use quite early. The most used of all the adverbs at this age are the modal forms and especially the negative, which were used before their complementary affirmative forms. This fact has been noted by a number of observers. Negation, indeed, is expressed preverbally at a very early age by turning away the head and by other expressive gestures. Jane was well into her third year before she used 'yes' at all and even after that she avoided it.

Pronouns. In this class Anne has the longest list to her credit and made the most use of it. In the development of

the idea of self each child used its given name in referring to itself, a habit which still persists with all of them. The first of the personal pronouns was 'my' in each case but at no time did it take the place of the name or of 'me,' as instanced by O'Shea (16) in such examples as "my feel bad," and "take my to bed." The author has never heard such use of 'my' by children although 'me' is frequently used in such places. The egoistic 'I' was first used by Jane in the twentieth month replacing the name only slowly and never quite driving it out of use. Since she first spoke of herself as Jane in the sixteenth month an interval of four months intervened between the stages of this progress. Daphne followed the same course, the time lapsing between the name and the first person singular being eight months, namely from the eighteenth to the twenty-sixth. Quite different was Anne's procedure for she began the use of both name and pronoun in the sixteenth month. This is due without much doubt to the example of her older sister. Stern (19) instances a number of cases where first-born children began to use the name three to eighteen months before the first personal pronoun, while younger children either used the pronoun first or else both this and the name came into use simultaneously. The only English speaking child in the list is Major's boy (12) who referred to himself by name in the twenty-third month and used 'I' first in the twenty-fourth. After being once learned the aggressive pronouns 'I,' 'me,' 'my' and 'mine' were much used for a time by the three subjects of this paper.

Jane continued progress by taking on 'you' and 'your,' then 'us' and 'we' followed by 'him' and 'she.' Anne acquired the third person singular first, then 'you' and 'we.' 'They' was later in both cases. Daphne referred to other people by name but began the use of 'our' during a visit with her cousins. Anne's more rapid advance in this respect is again to be attributed to the influence of living with an older child.

Conjunctions. Only Anne used conjunctions. Constructions requiring the use of these are the most difficult for children to learn. Of twenty vocabularies of two-year-old children this part of speech is recorded as lacking in eight and probably is so in others; another child at 30 months is in the same category, while one of three years used only 'and.' Both Jane and Daphne used pauses to take the place of 'and' or much repetition to describe concerted action, etc. Jane began the use of the conjunction at 30 months.

Sentence Form. From what precedes much may be gathered on this topic. All the subjects showed considerable feel-

ing for sentence structure and frequently attempted more than they could carry out with the materials at hand. An appreciable part of their talking was cast in interjectional mold and their resources were much supplemented by gesture, expression and pantomine in which again they do not differ from children in general. At times they did not take the trouble to use such small things as articles, the copula or prepositions, succeeding pretty well in being understood without them. The present time was most in their consciousness, the past was known but the future infrequently referred to. In all ways Daphne effected the most economy and simplicity of expression while Anne was the most prodigal.

Words in Common. Only 182 words are found in all three vocabularies, this comprising about 45 per cent. of Jane's list, 29 per cent. of Anne's and 60 per cent. of Daphne's. This list (printed in italics in the vocabularies) must be close to the minimum means of expression for an active child of this age. The two sisters have a larger proportion of words in common but even here individual preferences assert themselves.

Number Vocabulary. Conceptions of numbers above two were not understood by any of the children which appears to be in general the case. "Lots" meant quantity to Jane and Daphne while Anne used bravely but incorrectly many numbers in imitation of her older sister.

Color Vocabulary. In this category 'pink' and 'white' are found in Jane's list; 'black,' 'blue,' 'orange,' 'pink' and 'white' in Anne's and 'blue' in Daphne's. The latter used the first color term at 24 months; Anne's first attempt was 'pink' in the twenty-first month and Jane also began with 'pink' in the twenty-second month, the stimulus to the new interest being in each case a new dress. Children show such variability in the ease with which they use color terms (Bateman, 4) that the differences shown by these three is not surprising. Jane and Anne agree with other children in first using pink or red while such use of blue is rather unusual. It should be stated that while pink and blue objects were correctly named, the term itself was often applied wrongly to warm shades of yellow, orange, lavender and violet in the one case and to blue-green, violet and purple in the other. This confusion did not last long, however. In contrast to these children may be cited Miss Shinn's niece (18) who readily named all the spectrum colors at 22 months. Stern's son at 28 used only *schwarz* and *weiss* and did not use the other color terms until before the third birthday. Drever's son used blue, green, red and white.

Source of Materials. The results of an analysis of the nouns used by the children is shown in Table XV, in which the various rubrics sufficiently explain themselves.

TABLE XV

	Number			Per cent		
	Jane	Anne	Daphne	Jane	Anne	Daphne
Body	17	26	23	8.29	7.77	11.80
Health	2	1	1	.97	.29	.51
Clothes	19	31	19	9.26	9.27	9.74
Toilet	13	13	10	6.34	3.90	5.13
Food	38	48	35	18.52	14.34	17.95
Eating	13	16	11	6.34	4.78	5.63
Play	23	37	18	11.21	11.05	9.23
Experience	2	6	3	.97	1.70	1.53
I. Personal	127	178	120	61.95	53.10	61.52
House	38	68	39	18.52	20.39	20.00
Others' things	3	6	7	.46	1.70	3.59
II. Indoor	41	74	46	20.00	22.09	23.59
Landscape	3	7	1	1.46	2.00	.51
Plants	6	5	2	2.92	1.50	1.03
Travel	5	4	3	2.43	1.20	1.53
Animals	8	14	7	3.89	4.17	3.59
Miscellaneous	3	9	4	1.46	2.70	2.05
III. Outdoor	25	39	17	12.20	11.67	8.72
IV. Books	0	7	0	0.00	2.09	0.00
V. People	5	13	7	2.44	3.89	3.59
VI. Abstract	7	24	5	3.41	7.13	2.58
Total	205	335	195	100.00	100.00	100.00

The three analyses give quite dissimilar pictures. As is natural, considering the circumscribed activity of such small children, most of the material comes directly from personal experience. In this respect Jane and her cousin are about equal, both leading much the same life as only children in similar homes. Anne, on the contrary, draws much less in proportion from this source. In subheads under the general rubric Daphne was better acquainted with names of parts of the body but drew less on play. Jane had a larger percentage of words for food and eating although this did not reflect any personal excess of interest in such things. It is interesting to note the small showing of words relating to health, a condition faithfully reflecting the facts in the case.

The next most fertile field for materials was in the house and from here Jane drew least and Daphne most, while just the reverse was true when outdoor words are taken into account. When books, people and especially abstract terms are in question, it is seen where Anne made up for neglecting what only directly concerned herself for she leads in these divisions.

Environment. In the main all three children show by the analysis the molding of each by the particular environment, this being tempered by individual reactions to the same. The greatest factor affecting Anne and not the others is that she was directly and constantly stimulated by contact with another and older child. This accounts mostly for the larger size of the vocabulary, and for some of the differences just mentioned. Anne wished to do whatever her sister did and picked up early in this way many abstract ideas and words as soon as used by Jane who was almost two years older. The same companionship kept her from being so self-centered as the other two more lonely children. Daphne in particular had had but little association with other children and was thus thrown upon her own resources. At first thought since she lived in California one would expect her to know better the out-of-door world, but when it is known that she lived in the city and mostly within the confines of her own city lot while her small relatives had the advantage of the open fields and meadows right at hand the differences in the analysis are not surprising. Furthermore, when outdoors she was usually alone and little attention was directed to telling her the names of plants and insects while the contrary was true when in the house.

The abstract terms used were simple and with Jane and Daphne referred chiefly to quantity.

It is seen then in the main how faithfully each child reflected its own environment. The three of about the same natural ability are shown to differ in the results attained because of different circumstances surrounding them. Still other facts in this connection are brought out in what follows.

Interesting analyses of children's vocabularies have been made by Boyd (6) and Nice (15). The above table closely follows theirs, with which it may be compared.

Methods

One of the most interesting things to follow in speech development is the spontaneous efforts of the child to acquire self-expression. Conscious imitation is the first of these to appear. Jane and her sister reached this stage during the

seventh month, but while with Daphne the date is rather uncertain it was not much later than this. All three children developed into little chatter-boxes, repeating or trying to repeat day after day much that they heard spoken by others. Anne especially mimicked her sister, her desire to emulate in this direction being as strong as in other lines of activity. Of course the words were used purely in an imitative sense in each case for several months so that real use of language was preceded by a fairly long practice period. It was noted that during this time the principal work done was that of eliminating the many sounds which all children make early during the preverbal stage but which are of little use in speaking English. A number of observers have noted the richness and varied quality of the vowel sounds uttered by babies during the babbling period. Their vocal cords can negotiate the nasal sounds of the French and the umlauts of the German with an ease the adult can well envy. Most of this material the child must cull out in order to concentrate on the purely English vocables. However, Jane was well into the third year before she lost a certain French quality which colored her speech (Whipple, 21) while Anne was even older before the German tinge to her enunciation faded out (3). The conscious imitation or "parrot-talk" noted above seems to be characteristic of practically all the children whose language development has been traced; but Drever (7) notes an interesting exception where a child beginning to talk at sixteen months undertook the practice period after rather then before.

The author's two children as a side line from their babbling and chattering were especially fond of stringing together long series of sounds having a common vowel root. The elder girl preferred the 'og' sound of 'dog' while the younger child used 'ug' as in 'zug.' By the half hour together they would lie quietly gurgling in the one case, "oggle-woggle-doggle-noggle" and in the other, "guggle-wuggle-muggle." Their cousin did not develop this kind of amusement which has been noted by others (Pelsma, 17).

A little later all the children would willingly repeat words after their parents, striving to improve on their shortcomings in enunciation. In this Jane had most success while Anne was most eager.

All three retained the use of gesture from the preverbal period as an aid to their inadequate vocabularies and this was especially true of Daphne who at 28 months was the most expressive and vivid in pantomine.

As already described, imitation and repetition were badly neglected by the three subjects during certain stages of devel-

opment while the two younger failed to practice as well at these times. But while the two sisters recovered entirely from this depression, becoming even more energetic than before, Daphne, although proceeding to increase her linguistic resources, failed to take up imitation or practice again. Compared to her cousins she was a silent child. She did not, as they, talk and croon almost incessantly while at play. Only rarely would she repeat words or phrases after her elders while the others did so with pleasure. Neither did she have games in which words had a part or invent any new terms or find humor in sounds. At the time the three children were together (Jane aged 53 months, Anne 33 and Daphne 28) this comparative silence was quite noticeable. While the two were noisy at their play, laughing and shouting, Daphne took her pleasure seriously although always ready to smile. Unless a new word had some immediate use, usually of close personal value, she was quite indifferent to learning it while on the contrary the other children picked up all sorts of chance words from parents or strangers. Almost invariably any word uttered in their hearing with unusual emphasis was taken up quickly. Naturally enough Daphne's neglect of practice in linguistics led to comparative lack of attainment in speech, this being especially noticeable in enunciation.

The author has already noted in another place (1-2) the use of generalization by his children between two and three years of age. Their cousin had exactly the same trait. Like them she called every kind of animal a dog and was only beginning to differentiate at 28 months. Insects were called bees and usually bad ones in reminiscence of a sting by one. Pin did for a number of diverse objects and boy and girl for still other groups. This would seem to be characteristic of the speech of little children.

A decided factor in Daphne's development was the attitude taken by her parents. They did not use much 'baby-talk' considering it foolish and a draw-back to the child but they did unconsciously without giving the matter any real thought, talk down to the baby's limited mental experience. They simplified grammar, avoided polysyllabic words and used circumlocutions. Whenever their daughter insisted (which was often) on using simple phrases or even phrases of her own they followed her lead. Thus they said "Daphne no go," "no spill soup," "want go bye-bye," etc. Some conversation included baby-talk particularly the doubling of a word to make it more emphatic or even perhaps just for the sound such as "tum-tum" (stomach), "swim-swim" and so on. The family adopted quaint babyisms and so always

spoke of the kodak as "kolak," of bottom as "belem," of potatoes as "tates." During several enforced separations from her parents the child heard considerable baby jargon—"did ums want iskle tates for ickle tum-tum?"

Naturally this kind of environment materially influenced Daphne's progress, slowing it considerably. The parents soon perceived the drawback and changed their tactics but were now met with a certain persistence on the part of the child to use the old forms which only slowly broke down with training. There is little or no value in the method of simplification. Since the child learns largely by imitation it may as well follow correct models while it is about the matter. It leaves out what it is not mentally able to use but the framework it does acquire is ready for later additions when the child's rise in ability makes such possible.

Enunciation

Jane. Even from the beginning of talking Jane has spoken with a clearness rather unusual for a child. She took her time about articulation, did not hurry while she talked and so perhaps gained greater ease in enunciation. Always an observant child, her method was to calmly listen and then repeat with distinct utterance. In her baby speech very few of the inversions, substitutions and mutilations so commonly noticed were to be found. Initial 'r,' 'l,' 's,' 'ch,' 'th' and other ordinarily difficult sounds gave her no trouble. The principle type of pitfall was to be found in a consonant or combination of two consonants between two vowels. Thus 'pk' in napkin was vexatious as well as the 'v' in shovel. But during the time considered in this paper these were the only marked flaws in enunciation. Handkerchief she never tried to say but spontaneously fastened upon "hankie" as a good substitute.

Anne. The younger child did not speak so plainly as her sister. She took less trouble usually to enunciate well although at times devoting much time to practice. The same word would be repeated over and over again in an evident persistent attempt to get it right. Anne would willingly repeat corrections to her faulty diction but usually tried to make her efforts funny so that each repetition became less like the normal and so ridiculous that the lessons ended in laughter. Her greatest fault consisted in clipping most words so that the final sound was not heard distinctly. This was especially the case with nasal sounds, with 'y' and 'ing' but sometimes happened with vowels. 'R' and 'l,' however, were well enunciated. The double "ll" in pillow and jelly was converted

into ' dd ' or ' tt ' giving ' jeddy ' or ' jetty.' Final ' ing ' was often changed into ' ie ' though with considerable caprice. Mother had a history of several changes, being first ' muddie,' then in succession ' mudder,' ' munner ' and ' muzzer.' In the last stage, however, it was plain that the child was playing with the variations in this word and others and it often happened that four or five such variants would be used in a few minutes. Initial ' d ' was changed sometimes to ' j ' but initials ' r,' ' s,' ' th ' and ' sh ' gave practically no trouble. As already noted, many words were pronounced so as to make the vowel sounds much like the German umlauts. Anne readily noted her defects as listed above and strove to correct them thus improving greatly during the few months after the second birthday.

Daphne. In this field of linguistics Daphne had a system all her own. In the first place she had a decided preference for monosyllables, since in her vocabulary two-thirds of the words are in this class while those pronounced as one syllable in addition increase the percentage to 75. Practically no word was spoken as having more than two sounds. Thus automobile was ' aubi,' macaroni ' maco ' and canteloupe ' calo.' Of Jane's vocabulary less than half consisted of words of one syllable but of Anne's about two-thirds again so that both used about 200 polysyllables as contrasted to Daphne's 75. This preference for short words is not entirely due to the fact that they are easier for the child to say but partly because a large number of words in every day use are fortunately short. This is especially true of verbs, pronouns, prepositions and conjunctions. If the child wishes to use a word its length or difficulty of enunciation is no deterrent. Thus Daphne attempts canteloupe, automobile, rocking-chair and swimming-pool, while in Jane's list are found macaroni, mosquito, umbrella and others, and in Anne's such words as elephant, remember, sandwich, screwdriver and wheelbarrow. The use the child can make of a word or the interest it takes in the object or action connoted will prompt it to acquire difficult words.

Another characteristic of Daphne's speech was the greater use she made of ' l ' as compared with other children. This letter as initial was prefixed to practically all words beginning with a vowel sound. Thus she spontaneously devised for herself a sort of French definite article thus: ' l'app ' (apple), ' l'eye,' ' l'ear,' ' l'ĕ ' (egg), etc. The same letter replaced initial ' r ' and also initial ' w ' so that ring became ' lĭ,' rug ' lu,' rompers ' lomp ' while wipe became ' li ' and wet ' lĕ.' The same useful initial served also for the Y in yes. There were exceptions, however. All, ah-ha, all the words beginning with

I, out-doors, out, watch, water, want, where and we were given the correct initial sounds.

The aspirate was rarely sounded—as initial it was replaced by s as in 'souse' (house), 'sorse' (horse), 'sair' (hair), 'sa' (hat). Hot had the 'l' slipped in as well and became 'slaw.' Since many words were clipped of their final sound it was impossible to distinguish except by context between hand, handle, sand and sandal which were all pronounced alike. Exceptions to this were hankie and here. Initial 'th' was sometimes 's' (thread, thumb) and sometimes 'd' (there). In 'sh' the 'h' was left out.

The initial in certain words beginning with 'f' was also replaced by 's' (fig, fix, fish-man). 'T' replaced initial 'k' except in kodak, the 'q' of quiet, even the 'c' of cup and coffee. 'G' was converted into 'd' in girl and get. 'R' was another sound rarely used since it was replaced usually as initial by 'l' and lost in broken, bread, brush, drink, drawer, etc. As final it gave less trouble but shared the common fate of such sounds in usually being left off.

In spite of the easily used 'l' it was left out in blue, block, flower and floor; while the 'cl' of clothes, clothes-pin and clean was changed into 't.'

It will be noted that the child while considerably changing the accepted pronunciation of English was rather capricious about it. She did not eschew all difficult sounds nor always treat the same sound alike. It was discovered, indeed, that she used her own diction to a certain extent because she so wished and not necessarily because she was forced to adopt wrong sounds through inability to use the right. During the few weeks preceding and during the taking of the vocabulary her parents endeavored to improve her enunciation but she did not respond willingly to their efforts. As already noted she would not imitate and cared little about practice. The word 'bib' she always pronounced 'nib' and when corrected sometimes said, "No say bib, say nib." And this she calmly did. Other words could be used conventionally, too, only she preferred her own forms. As an experiment her uncle tried for a month to get her to say potatoes instead of "tates," trying all methods of cajolery, coaxing and commanding. Finally, just once, she said, "potatoes," very distinctly and then with a roguish glance followed it with, "want more tates."

This adherence to her own system had one disadvantage. She was frequently not understood. Sometimes when she volubly told a long tale with much expressive intonation even her mother could not always follow. It was evident that this

had a discouraging effect and accounted for some of her comparative silence. Later her parents pretended not to understand certain imperfect words which they knew could be said correctly but their child understood the game and rarely gave in. Under those same circumstances her cousins would probably have acted quite differently. If it were a question of getting candy by correctly pronouncing the word, Jane would gracefully do so at once and greatly enjoy the reward; Anne would pout and hold back a little and then say the word quickly; Daphne would say nothing and do without the candy.

Such trials had an educational effect, nevertheless, for it was noted that the most recent acquisitions to Daphne's vocabulary were more correctly and distinctly pronounced. Thus sardine, teddy-bear, suit-case, lady-bug, shaving-brush and others were plainly enunciated.

Conclusion

In this brief survey of speech activity the author has tried to show how decidedly the language development of these three children who have much the same heredity, who in general are on a par physically and mentally, who are of the same sex and age, has been influenced by individual differences of temperament and by different factors of environment.

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MICROMOTION STUDIES APPLIED TO EDUCATION [1]

By A. A. Douglass and W. L. Dealey, Clark University

Within recent years school progress has witnessed remarkable advances in educational engineering, including such devices as the junior high school organization, the Gary duplicate-school system, with maximum use of the school plant, the school survey, and the various measuring scales for school subjects. From among similar useful devices in modern industrial management, micromotion study as developed by Gilbreth, a consulting engineer of international reputation, constitutes a method admirably fitted to study methods of instruction and the processes of learning. During the present school year a first series of experiments has been conducted for the purpose of testing the application of this method to the schools. These preliminary experiments have been thus far in the field of practical arts; and while the technique used is more applicable to the arts, indications are it is not limited to them, but may be used with the phonograph feature to study other school subjects as well. This investigation will be carried into these other subjects, and the applicability of the method to all phases of school work thoroughly tested.

It seems agreed the ends of practical arts courses lie in their educative value and the acquisition of skill. The amount of skill sought is a point of disagreement, for some would subordinate its acquisition entirely to educational value, and others would develop skill to a degree profitable to the pupil in earning his living. Unless the general aim of "educational values" be closely scrutinized and more immediate ends

[1] This preliminary study was made in co-operation with Frank B. Gilbreth and L. M. Gilbreth, and contains many excerpts from numerous articles and addresses describing the details and possibilities of their standard measuring devices. The underlying experimental work was done at Clark University and in the Gilbreth laboratory. Films and cyclegraphs were made by Gilbreth and various of his experts at the Bridgham Elementary School, Providence (R. I.).

We take this opportunity to thank Principal Leonard H. Campbell, Mr. Andersen, in charge of manual training, and Miss King, in charge of sewing, as well as other members of the school staff, for their co-operation and interest in this investigation.

FIGURE 1. — Manual arts class, eighth grade, Bridgham School. Note chronometer measuring thousandths of a minute and clock alongside.

FIGURE 2.—Household arts class, sixth grade, Bridgham School. Sewing machine operation.

FIGURE 3.—Household arts class, sixth grade, Bridgham School. Upper, cutting pattern. Lower, ironing.

interpolated, practical arts courses are in the same danger of formalism as any other subject. Also, unless it is determined just what constitutes skill, whether it be for promoting creative activity or for more utilitarian purposes, the educative process will be hindered. Modern psychology, stating these two factors in terms of situation and response, treats reaction as due to the interaction of innate capacity and previous situations containing factors common to the new situation. The theory of interest as laid down by Dewey asks that a boy be allowed to choose his project in manual arts, and in other subjects the same principle insists that subject-matter be psychologized, or stated in terms of capacity and experience. Because of wide ranges in abilities and in environmental factors, and on account of our present lack of knowledge of the responses particular elements in a situation produce, we cannot outline courses or projects in a minutely detailed fashion.

The waste in the process of learning is due to ineffective and ill-advised methods of handling the elements in a situation, and an ignorance of any method of eliminating useless elements. In any common school process, searching investigation will usually show surprising inefficiencies and possible improvements. The school surveys are revealing conditions in which the child's time is wasted in useless activities and obsolete material, or, in other words, surveys are pointing out environmental elements ineffective in producing efficient responses. Economy of time, says Ayres, will be secured only when we realize the amount of time at our disposal is a constant, roughly about eight years; so that saving 35 minutes a day results in saving one year of school life.

As two fundamental problems, Learned therefore suggests, first, how to have "educational processes conclusively tested by competent observation under experimental control; second, how to professionalize the whole number of practitioners engaged in education for the sake of a quick and efficient response."

Our first attack, then, is the careful analysis of elementary situations to evaluate the variables lying within them. As the same situation may elicit multiple response, this method of attack considers the behavior desired as a demand for a certain response, and the child as a potential supply of certain responses. With Thorndike, the mind is interpreted as a connection system, and the educative process as the building of connections. The importance of definite tasks, or *Aufgaben*, with their corresponding mental attitudes, is recognized. As Ach puts it, by definite and concise instructions we set up a dynamic factor as the determining tendency which controls the child's response. But in many classrooms the

actual conditions under which any such procedure—commonly called a lesson assignment—takes place are slightly analyzed. The absence of this analysis, as Hosic aptly states, usually means low pressure, much useless wandering, and great unevenness of results. Gilbreth suggests a few well-chosen, first-class standards, or *Aufgaben,* as much to be preferred to many ill-chosen, imperfect standards, derived from uncontrolled observation. To suppose that individuality is thereby repressed is a common fallacy. According to Cooke, a standard is "simply a carefully thought out method of performing a function;" necessarily the best method known to expert investigators working with the best type of class; and as Snedden suggests, standard or best scores are optimum, not maximum. School tasks may be synthetically built up from least wasteful units, allowing a definite percentage of time for rest and for unavoidable delays; while after the child or teacher learns the best way, he has a starting point for any better method ingenuity can suggest. Such tasks, as well as conditions, are continually changing.

The standard motion is a synthesis based upon analysis of the motion elements taken from the records of various individuals, and the best elements of the motions are combined to form simpler, easier cycles arriving at the same result. Among the elements of a cycle of decisions and motions, concurrent with other elements in the same or other cycles, and in various sequences, Gilbreth suggests (1) search, (2) find, (3) select, (4) grasp, (5) position, (6) assemble, (7) use, (8) take apart, (9) inspect, (10) transport, loaded, (11) preposition for next operation, (12) release load, (13) transport, empty, (14) unavoidable delay, (15) avoidable delay, (16) rest (for overcoming fatigue). Unit times and motions grouped under such rubrics may be applied to identical motions used in many class exercises, for they afford the basis for a "functional" reclassification of activities. It will hardly be held that the best methods,[2] in the practical arts, for instance, have already been reached, even by those who possess a fair degree of skill in them, so long as scientific study of existing methods is wanting. While some unnecessary movements are eliminated, it is inconceivable that all individuals will, after a time, arrive by a process of elimination at the most efficient method of procedure. It is reasonable, in prac-

[2] Wentworth has based assignments in algebra upon time studies. In another school, of 70 tasks in the chemical laboratory set after three years' actual time study, only 3 were found too long for the average student. Godfrey has worked out tasks in studying scientific text. In view of present wide variations in the time required to prepare even similar material, such random scientific analyses are important to illustrate the possibility of setting tasks for mental work.

tical arts work, to teach "exact prescribed motions that have been found to be the most productive, the least fatiguing and the least wasteful," at a speed most advantageous to the child.

The variables in a child's behavior have been roughly grouped as (1) those variables, that, when taken together, constitute the situation, by which (2) the child, itself a group of variables, is affected, with (3) a further resultant group of variables in the response. Gilbreth lists over a hundred such variables, any one of which may be at least partially controlled. As regards *variables of the surroundings,* it is important that the child be given conditions requiring the "least percentage of rest" to overcome fatigue. This involves complete control of the class room by school hygiene, as in lighting, heating, ventilation, for example, or as in posture. Special fatigue eliminating devices become practical. Another variable is the material to be used, which should be in that state most easily handled by the child. Thus weights moved, whether part of the body, a tool, or material, are a factor. Moreover, motions being largely determined by the appliances used, it is essential that all appliances meet the motion economy standpoint. It is especially important to supply children with the proper tools, as otherwise the habits formed will later interfere with the use of better tools.[3] Care should be taken lest pupils waste their time in activities which cannot be shown to have functional value. The pupil's time is valuable and should be spent upon productive learning.

Plate II, figures 1-3, shows the movements made by a boy in taking (1) a spoke shaver, (2) a chisel, and (3) a chisel, out of the tool rack and laying them on the table; figure 4 shows on one photograph all the movements made in taking eight different tools out of the rack and laying them on the table.

Plate II, figures 5-8, shows the movements made in replacing (5) a knife, (6) a chisel, (7) a marking gage, and (8) a spoke shaver in the rack from the table.

It is noticeable that the movements for supposedly the same operation are by no means the same, and that the operation is hindered by the present arrangement of the rack.

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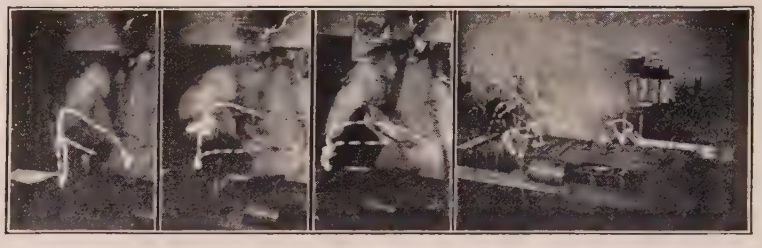
[3] According to Emerson, we are still teaching our children to read fairy tales instead of watching moving pictures; we teach them to write to the exclusion of training on typewriters or in stenotypy; we painfully drill into them multiplication tables instead of initiating them into the mysteries of the slide rule; we teach them to add and subtract, neglecting improved devices such as the comptometer; we teach drawing, but pay no attention to the uses of photography; in short our schools have not advanced to the state of using modern devices.



FIGURES 1-4.—Removing tools from rack, manual arts class, Bridgham School

FIGURES 5-8.—Replacing tools in rack, manual arts class, Bridgham School

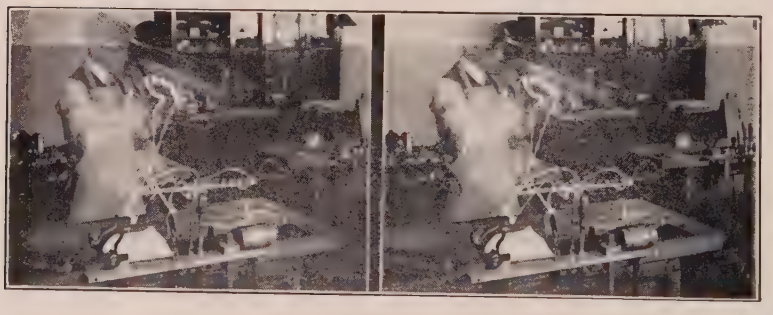


FIGURE 9.—Chronocyclegraph of boy planing, manual arts class, Bridgham School

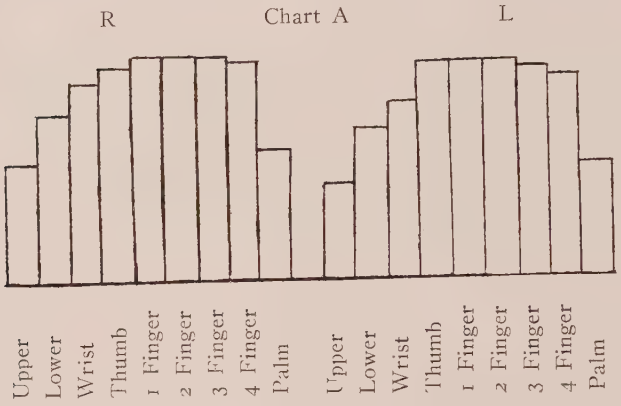
The elements of the child's organization, innate and acquired, constitute the *variables of the child.* Children differ greatly in physique, as shown by Baldwin's tangible norms of

height, weight, and lung capacity, while the child's body is structurally different from that of the adult. In this connection, Swift found that the more complex the motor skill, the more easily is it disturbed by physical changes in the body. The child's health, whether dependent on conditions within or without the school, and fatigue, whether due to coming to school improperly rested or to necessary school work, are essential considerations. Every motion causes fatigue and requires a certain percentage of rest, which should be computed with great exactness and properly distributed. Factors contributing to the child's health, such as medical inspection, school lunches, open air schools, provision for play, are many; but school work itself should add to health.

Since the development of the muscular system proceeds from the fundamental to the accessory, an early emphasis upon fine co-ordinations is not hygienic. During the period of lessened motor control that comes with puberty, Hall[4] believes the adolescent should develop the more basal muscles while the finer ones are somewhat relieved. From this same point of view, Burnham argues for a thoroughly hygienic environment and the acquisition of habits distinctly conducive to health; in discussing the hygiene of manual arts he calls attention to the important fact that the nervous system is conditioned in its development by motor exercise. The development of the muscles during their period of rapid growth goes hand in hand with that of the nervous system. Again, while this period of instability presents opportunity for rapid educational progress, the greatest care is needed, for the early adolescence is peculiarly liable to ill health. The advent of pubescence varies with the individual, so this factor must always be taken into account.

Such variables reveal the importance of our methods if for no other reason than for evaluating present manual arts courses. Chart A, for instance, suggests that a study of manual training projects comparing time spent upon fine co-ordinations with the time devoted to the more basal muscles, would lead to surprising results. How much of manual arts work demands delicacy of movement rather than strength? How much time is spent in sandpapering and other finishing processes requiring only the fingers and wrist, as compared with sawing, nailing, or other processes more adequately meeting the hygienic conditions of growth? Can such courses, spending the major part of effort in finishing operations, have the "educative value" of courses utilizing constructive pro-

[4] Monroe's Cyc. of Edn., articles on Adolescence; Hygiene of Adolescence; and Hygiene of Manual Training.


R
Chart A
L
Upper
Lower
Wrist
Thumb
1 Finger
2 Finger
3 Finger
4 Finger
Palm
Upper
Lower
Wrist
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1 Finger
2 Finger
3 Finger
4 Finger
Palm

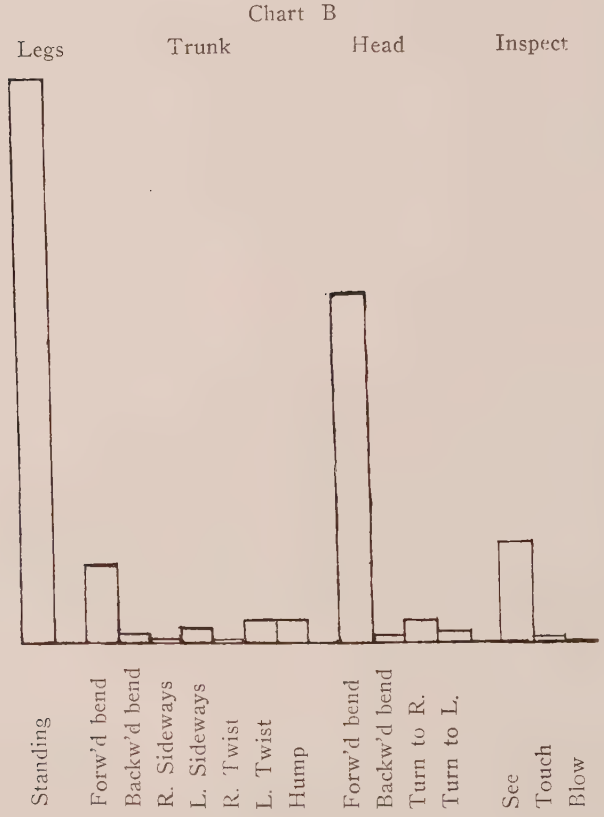


Chart B
Legs
Trunk
Head
Inspect
Standing
Forw'd bend
Backw'd bend
R. Sideways
L. Sideways
R. Twist
L. Twist
Hump
Forw'd bend
Backw'd bend
Turn to R.
Turn to L.
See
Touch
Blow

jects? Charts A to D summarize the motion cycle charts of five boys working upon different projects in different stages of completion. It should be added that this class in manual arts was not a random selection, but carefully chosen, after visits to many other schools, as representing best practice. In Chart A, the relative amount of time different parts of the right hand were used is shown by R; the left hand, by L. The fingers were used practically all the time; the upper arm and palm only *half* the time, with an apparent correlation between the use of the palm and upper arm. Chart B supplements A, in showing the activities of the trunk, head, and form of inspection used. The posture throughout was standing. It will be noticed that the trunk was bent forward a noticeable part of the time, and that the head was bent forward most of the time.

The child's experience affords many variables, connections between previous situations and responses varying greatly in different children. Detailed studies of situations and resulting responses should aid each pupil "(1) to try to form certain bonds rather than others, (2) to form them in a certain order, (3) to identify more easily (than if left to his own devices) the bonds he is to try to form, (4) to be more satisfied at the right bond, and more unready to repeat the wrong bonds." The most direct way of controlling child activity is by practice and habituation, and conversely, former habits are often difficult to overcome. How many teachers consider that time will be lost if the habits formed in the lower grades are such as cannot be used later? Finally, the social setting of the child's life is important in determining the particular level of his experience.

A related factor is the child's motivation, or interest, which results in greater willingness and concentration, and requires less rest for overcoming fatigue. At present there is an attempt to curtail the loss in interest arising from unmotivated study and from the present methods of conducting recitation. In the manual arts work, for example, the test of "interests" is the choice of projects. Interest is thus a blanket term which includes the child's attitudes (*Einstellungen*) and definite tasks (*Aufgaben*) acting as stimuli; while "the adjustment (*Einstellung*) is the product of all the factors which make the disposition of the learner toward his task at any given time." From a pedagogic side, it is of interest whether a survey of classes in manual arts would show identical work assigned to all pupils. Park and Harlan '15 in a questionnaire study of practical arts in 156 cities, found seventeen per cent. using systematic graded exercises, then in order, individual pro-

jects selected by the pupils, co-operative projects selected by the group, and projects expressive of other phases of school work; while systematic graded exercises were combined with individual projects in twenty-three per cent. of the classes. A "group system" of projects would seem most adjustable to individual variables, the class remaining in a given group until the slow worker completes at least one project within that group.

Among the *variables of motion,* next to fewest motions, a standard speed, which means simply the rate producing the desired results most efficiently, is most important. Motions should be such that as few starts and stops as possible occur; for if momentum must be overcome rather than utilized by the child's muscles, fatigue will result. The most economical direction is important, and results in standard paths. Motions should be shortest possible. The plane in which the work is done should be carefully located; for balanced motions counteract each other, resulting in less fatigue. "Most work is accomplished when both hands start work at the same time, and when the motions can be made at the same relative position on each side of a central fore and aft vertical plane dividing the worker's body symmetrically." In proper sequence, each motion combines economically with succeeding motions.

Charts C and D, for instance, suggest definite inefficiencies in the control of these variables. In Chart C, the right arm is represented by R; the left, by L. This reveals the relative percentages of the entire time that the arms were occupied with the various elementary motions noted. These are summarized in Chart D, which shows under R the time the right arm was engaged in the operations "use" and "transport loaded," as compared with time employed in other operations admittedly less productive. It is important to note a longer time is spent upon these other more wasteful operations than upon the more constructive, use and transport loaded. This is even more striking for the left arm.

As aids in controlling such complex series of variables, elaborate measuring devices have been developed by Gilbreth. The essential of the micromotion method is to record by photography the best activities found. The cinematograph film presents in the most objective way possible, numerous, accurate observations of the individual's behavior under normal school conditions. It offers a continuous record with no time gaps except the slight intervals between pictures, obviated where necessary by using a double cinematograph, so that the pictures overlap. By photographing with a child's behavior a Gilbreth chronometer recording the thousandth part of a

minute, the relative times of the elements of the response are permanently recorded. The relationship between this timing device and motions too small even for the eye is always constant. A cross-sectioned screen may be included to mark the dimensions of the motion. Every film then reveals the successive positions of the child in performing each minute operation of his task. By exposing only a portion of the film, through a special type of shutter, as many as 24 pictures have been crowded into a single reel, to cheapen costs (see Plate III, figure 5, page 252).

It was anticipated that difficulty would arise from lighting conditions; and that our camera would itself be a complicating variable, preventing normal behavior by the children. The former condition was met in a satisfactory way without the introduction of artificial lighting; while the films show scarcely any embarrassment on the part of the pupils. This is extremely important, for if it were necessary to rehearse pupils extensively, results would become artificial. Pupils were not informed beforehand that pictures were to be made; and though opportunity was given, no one withdrew. A camera

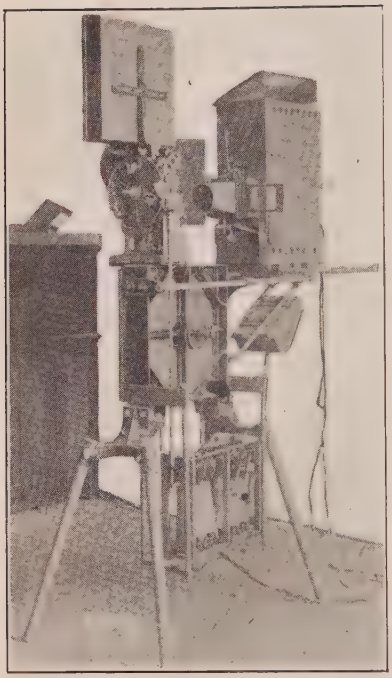


FIGURE 1.—Motion picture apparatus and solenoid motor. Kellum Talking Picture Company, Los Angeles.

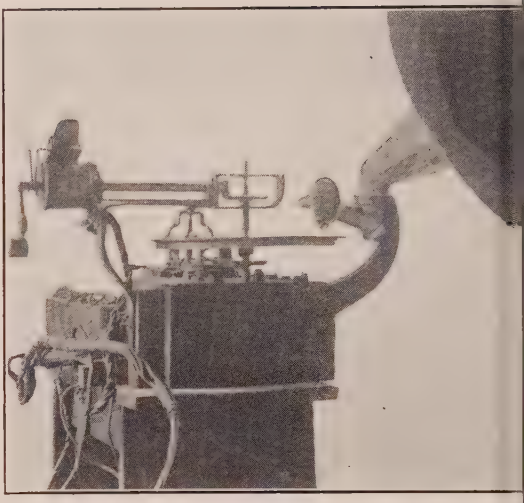


FIGURE 2.—Phonograph fitted with commutator controlling solenoid motor. Kellum Talking Picture Company, Los Angeles.

FIGURE 3.—Gilbreth motion models of cyclegraphs.

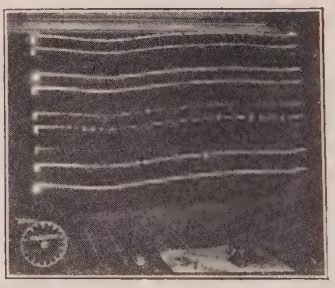


FIGURE 4.—Time flashes obtained with different chronocyclegraph interrupters.

FIGURE 5.—Gilbreth multiple picture film. Enlarged by throwing on screen.

was set up in a corner, the class proceeded as usual, and pictures were made from time to time. We are therefore convinced these theoretical objections break down in practice.

To show directions, speeds, and continuous paths of motions, the Gilbreth cyclegraph records were devised. They visualize with ease the path taken by the motion. Small electric-light bulbs attached by flexible wires to moving parts of the body, mark the motion paths by lines of light, recorded on the photograph as white lines. Interrupters in the light circuits change these lines to a series of dots or dashes, and a variety of interrupters enable the simultaneous photographing of different moving parts (see plate III, figure 4). By using tuning forks vibrating a known number of times per second, exact periods of elapsed time of any desired duration are photographed. These are termed "chronocyclegraphs." Direction of motion is shown by using lamps with thick filaments and the right combination of volts and amperes, vanishing by quick lighting and slow extinguishing of the lamp, in distinct points. Exact distances are obtained by the penetrating screen. Through a multiple-exposure method, a cross-section screen of known dimensions may be placed in any plane of the picture, for example, in the very plane of work, or where necessary, enclosing the individual in a four-, five-, or six-sided net; the motions are photographed upon this screen. Combining methods, the path of motion, relative and exact time, relative and exact distance, and direction, are photographed in three dimensions by a stereoscopic camera. The chronocyclegraph, in plate II, figure 9 (page 246), for example, shows the movements made by a boy in (1) picking up a plane; (2) taking two strokes with the plane; (3) laying down the plane; (4) taking up a trisquare and the piece of wood; and (5) testing the piece of wood by running the trisquare along the edge. The lines show the movements made by the head, the right shoulder, the right hand, and the left hand. The picture is stereoscopic. The motion may be made actually tangible, and thus viewed from all angles, by a wire model exactly representing path, speeds, and directions (see plate III, figure 3). The elements of the motion path are transferred from one or more cyclegraphs to the wire, which is then placed in a cross sectioned box for analysis.

From these records, "simultaneous motion cycle charts" are made to show in concrete form which members of the associated units of the child's body are performing the various elementary motions. Various working members of the body are used as column headings, and the motion elements placed on a vertical scale as to time. These columns divide into such groups as right and left arms, consisting of the subgroups,

upper arm, lower arm, wrist, thumb, first, second, third and fourth fingers, palm; right and left leg, with the subgroups of thigh, knee, calf, ankle, heel, and toes; trunk, with such subgroups as forward bend, backward bend, bend to right, bend to left, twist to right, twist to left; head, with subgroups of forward bend, backward bend, turn to right, to left; eyes; such general headings as posture, including sit, stand, kneel, stoop, right forearm supported, left forearm supported, right hand supported, left hand supported, back supported, head supported; or as inspection, including see, smell, touch, hear, blow, count. By showing the inter-relations of a simultaneous cycle, this device facilitates inventing more efficient arrangements of motions.

The accompanying segment of a motion cycle chart compares the arm movements made by two boys in reaching for a piece of wood, transferring it to a vise, tightening the vise, taking the plane, and planing. The unit of time is one-four-hundredth of a minute. The movements are charted from the film of a manual arts class at the Bridgham School. It is noticeable that different motions are used to perform the same operations; that the movements in planing are not uniform throughout; and that one boy is distinctly less efficient, with a large waste in his motions preparatory to planing.

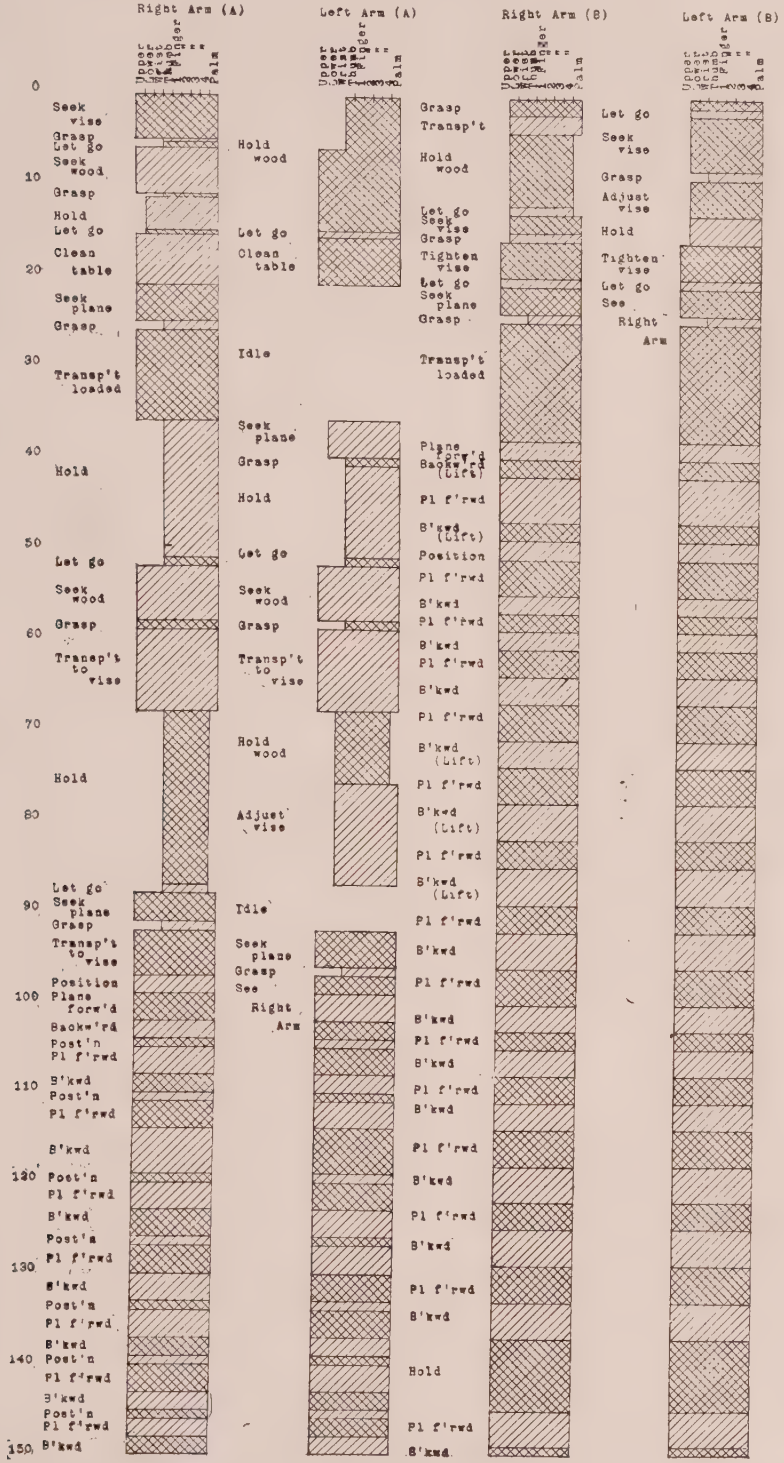
In the application of such devices, there should be co-operation between the experimenter and the teacher. There is much in any school subject that the teacher however ingenious or specialized cannot be expected to do; the expert simply makes valuable suggestions as a base line from which to estimate efficiency. Following "scientific management," it would be profitable if specially equipped planning departments could be established in connection with school systems, to make investigations and suggestions.[5]

President Hall has suggested that concrete films may demonstrate individual differences between children. The movements of the individual may be charted at any stage in the learning process, compared with another individual supposedly at the same stage, or with a chart representing the learning sought, while the end product resulting from these processes remains as a further means of judging learning.

Thus, Chart E contrasts the movements of two boys engaged in planing, both working exactly the same length of time. One boy is noticeably more efficient than the other. Boy A's piece of wood was about half as long as Boy B's. Boy A made

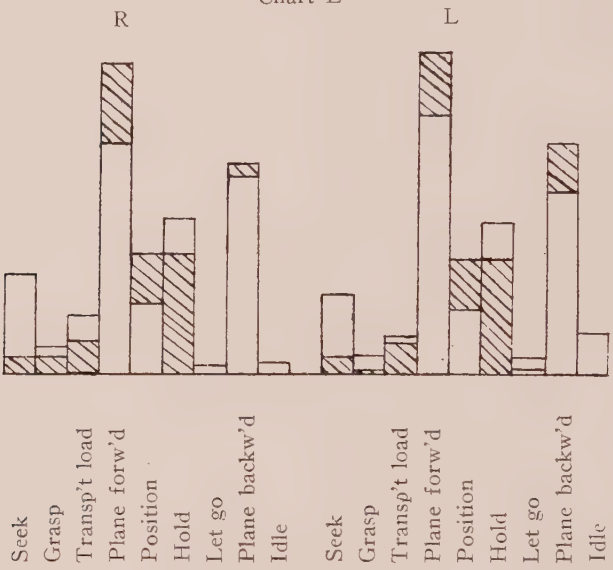
[5] Baltimore, Boston, Chicago, Detroit, Kansas City, New Orleans, New York, Oakland, Schenectady, and Rochester have developed bureaus of educational research.

SEGMENT OF SIMULTANEOUS MOTION CYCLE CHART
(Contrasting Arm Movements of Two Boys Engaged in Planing)



32 strokes with the plane; Boy B (shaded), 42. Boy A "let go" 7 different times; Boy B, once. They stopped planing to inspect their work about the same length of time. The average time to plane forward was 3 units for Boy A; 3 for Boy B; to plane back, 2.5 units for Boy A, 2 units for Boy B. Boy A always let the plane slide back on the wood; Boy B lifted the plane clear in returning it one-third of the time. Boy A always came to position before planing forward; Boy B came to position about one-third of the time, but held his position nearly twice as long as Boy A.

Chart E



The principle that wrong habits formed under one set of conditions work as a disadvantage in learning and cannot be transferred without loss may work a radical change in methods of teaching in manual arts. To discard unproductive habits later results in interference and consequent unnecessary fatigue. To judge the child's accuracy by his conforming to the best sequence of the best motions would then become the proper basis for organizing higher forms of behavior. As fast motions are different from slow motions, it would also follow in habit formation that the learner should be taught the standard speed from the first day.

Qualitative analyses are stressed, since through performing the correct motions at the correct speed the standard quality

should result. To make quality of output our preliminary standard might result in incorrect motions and times; while to judge by the quality of output in a given time is more a test of effort than of motions used. The Gilbreth film scale is strikingly complete, with its photographic record of all attendant variables of the process. This is an advantage over measuring scales depending entirely upon end product, and should therefore afford a valuable supplement to them. Otherwise, present scales may tend toward more formal aspects of reading, writing, spelling, or arithmetic, rather than the processes involved. As Buckingham points out, it is increasingly evident that present general scales will give place to more specific ones, each suitable for a particular purpose and applicable to a given situation. When supplemented by a synchronous phonograph feature, film scales should be a complete record of any standard.

In conserving the individuality of the child, the qualitative emphasis is further realized through such "management" mechanisms[6] as departmental teaching and flexible promotions. Systems of vocational guidance, using an empirical method of trial and error, rotate the child through various pre-vocational shops, until he appears adjusted. Motion study would imply a more precise analysis of responses, carefully pointing out the tasks at which a boy is first-class, opening wide possibilities in guidance. Poorest units are brought to the level of the present best, while the present best establish a higher standard, thus promoting exceptional children out of competition with ordinary children. The "theory of tolerances" emphasizes the excessive waste from over accuracy, as training beyond a certain optimum value is waste. Every standard under scientific management possesses its tolerance, with a further zone of flexibility for variations in individual ability.

Such standards are peculiarly applicable to the practical arts, whether in technical or trade schools,[7] pre-vocational

[6] In our opinion, the efficiency engineer, such as Gilbreth, with his conception of scientific industrial management as an educational process, is making an important contribution to education.

[7] "We have never heard of a trades school, manual training school, or technical school that makes any attempt to solve questions of motion study. The usual process is to teach a student or apprentice to do his work well at first, and after he has finally accomplished the art of making or doing the thing in question, then to expect him to learn to do it quickly. This process is a relic of the dark ages. A novice should be taught to do what he is trying to do with certain definite motions, and to repeat the operation until he is able automatically to use the standard motions and do good work." Gilbreth, Motion Study, New York, 1911, page 51.

classes, or household arts; to such arts as drawing or instrumental music; and to laboratory work in the various sciences. It has been asserted that the value of the Gilbreth measuring devices is limited to such subjects. Apart from the immense possibilities in the motion picture film scientifically controlled, such an assertion dodges the essential principle of "learning by doing," with which it is hoped to vitalize the academic curriculum; from a psychological standpoint, it overlooks the fundamental rôle of kinesthesis and the modern emphasis upon objective behavior. These methods may be associated with the present advance of behaviorism into experimental education, as laid down in Hunter's delayed reaction experiments, Yerkes' multiple-choice experiments, or studies of the conditioned reflex, by Krasnogorski, Mateer, or Watson.

The Gilbreth methods not only chart actual movements with exactness, in three dimensions, including time, but so far as facial expression or other movements indicate process, process is arrived at as well. Though frankly working, as Angell says, with "two terms of a series of events of which the intercalary links are frequently most complex and significant," yet a record of actual conditions calling forth certain responses should aid in arriving at the underlying processes. We are, for example, filming a geography class at the Bridgham School, and hope that its careful analysis will elicit many interesting details. But it is primarily with big muscle activities, manual activities, activities connected with the child's environment, economic activities, social activities, dramatic activities, rhythmic and musical activities, in short, activities as described by Dewey or Flexner or others of the new school of learning by doing, that the beginning should be made.[8]

It should also be remembered that we regard a synchronous phonographic record as an essential adjunct to these devices. There is the Edison kinetophone or Gaumont chronophone, but we believe the electrically driven apparatus perfected by the Kellum Talking Picture Company of Los Angeles the most suitable for our purposes (see plate III, figures 1-2, page 252). The willingness of this company to co-operate, even to the extent of a possible branch laboratory, is most encouraging. In their apparatus the speed of the phonograph regulates a commutator which controls the motor driving the camera, thus insuring absolute synchronism. The result is a high degree of graphic representation, continuous with the length of film required. In a history class, for example, by tabulating such phonographic records, we would know with a fair degree

[8] As in, Hetherington, C. W. The Demonstration Play School, University of California. 1914; Bourne, R. S. The Gary Schools. 1916.

of accuracy "what the common pabulum of the elementary curriculum in respect to history" is; and similarly for other subjects.

Wilson '15 cites the investigation of a public school in Manhattan by the Bureau of Municipal Research, which found by reporting 18 recitations stenographically, that teachers were doing the thinking and talking rather than the pupils; teachers used 18,833 words; pupils, 5,675, with 420 one-word responses, 208 one-sentence responses, 96 phrase responses, and only 20 extended replies. There were 622 "what," "when," and "where" questions, and but 138 "why" or "how." Similarly, Stevens '12, by stenographic reports of 20 random New York classes of 20-40 pupils found 64 per cent. of the spoken words teacher activity, and but 36 per cent. of the spoken words divided among the pupils. Different classes varied from 116 to 206 questions and answers in a forty-five minute period. In 6 history lessons, the percentage of questions involving judgment ranged only from 5-27. In a group of 7 classes averaging fewer than 90 questions, 63 per cent. were memory questions repeating the text-book, in 9 other classes, 73 per cent. Horn '15 in the Teachers College Record prints stenographic reports, and Farmer '14 made use of them in his survey of Wisconsin normal schools. Such methods are suggestive, but inadequate when contrasted with complete, synchronous phonographic and photographic records.

With reference to the second fundamental problem outlined by Learned, these methods should strengthen the teacher's efficiency. This is a true form of modern school inspection, since it attends to the process itself, and demonstrates its significance to the teacher. Cinematographic and cyclegraphic photographs, phonographic records and motion models would serve as most admirable teaching devices, for through them there could be transferred the "selected elements of skill and experience, in a new synthesized cycle of least waste." In the practical arts such a teaching device as the motion model visualizes the motion path. The films passed from teacher to teacher, record in concrete detail the best methods of doing school work.

As outlined, classes in manual arts, household arts and geography of the sixth and eighth grades, have been filmed in the Bridgham School, Providence. This school is superior to the average, and so selected after inspecting other schools. In the junior high school movement, there is the similar possibility of including junior high school grades and subjects, filming the best procedures in these schools; and eventually developing standard film-scales for rating any junior high school.

A single film may contain in rapid, contrasting series, for ranking by relative position, superior, mediocre, and inferior solutions of any school situation. Films containing such advanced data should constitute a distinct force in developing backward schools. Similarly, in one-room rural schools, some 200,000 in number, it is but a step in technique to supplement by films the slides now made for the Department of Agriculture. The possibilities of illustrating school surveys by such photographic features are extensive, as compared with slides now made in routine practice. Existing measuring scales themselves, if supplemented by standard films of their procedures as instructions for presentation, should gain in precision. Though careful attempts are made in the experimental work of psychological laboratories to control and record attendant conditions and train research assistants to observe correctly, it is difficult to reconcile present practice, utilizing written notes and individual observers, with complete, permanent films or phonograph records having all attendant variables and susceptible of full verification. It is unsafe to limit the possibilities of micromotion films, supplemented by the phonographic feature, whether as controls in the laboratory, or as standards of teaching efficiency and instruction cards pictured to the last detail.

In fact, in the Clark University laboratory, Snoddy '15, has applied the Gilbreth cyclegraphic method in a careful, as yet unpublished study, of the learning process in mirror-tracing a star. At Chicago, Freeman and Gray now report intensive studies of handwriting and reading. "The use of moving pictures and of a hand tracer in making possible the study of the rapid motions and the fine adjustments in writing and the use of a two lensed camera, operated synchronously with a phonograph, to record the eye movements, vocal adjustments and the time elements in reading, give promise of enabling an analysis that will show the motor correlates of good and poor reading as well as suggesting the psychological concomitants." Or, again, according to Saunders '14, the Colonial Motion Picture Corporation is preparing to illustrate in motion pictures such texts as Thorndike and Strayer's School Administration, and such suggestions as the "evolution of the rural school." Roach (Philadelphia) '13, illustrated his paper at the Congress of School Hygiene (Buffalo) with motion pictures of the Bache open air school, showing under actual conditions a series of physical exercises, for which the film serves as an instruction card. In the school phase of athletics there are already many excellent films; while Haughton '15 used the cinematograph to film plays of the Harvard football team, dis-

covering and graphically demonstrating faults. These are random examples of coming activity in this field, which should bring to the moving picture and its accessory devices a rôle of high significance in experimental education. As G. Stanley Hall suggests, the moving picture, with its inherent possibilities, marks an epoch. Under the stimulus of this new field for experimentation there will doubtless be a rapid development of many-sided applications to the newer education.

THE PROFESSOR VERSUS THE LIBRARY

A reference librarian in a college library serves as a buffer between students and members of the faculty. He receives the impact from both sides, and is alternately swayed from the one point of view to the other. Possessing also an independent point of view of his own, he thus becomes a triune personality, an individual triple entente. Like Dr. Holmes' John he is an inescapable trinity, and reaps the advantages and likewise all of the disadvantages of his personal multiplicity.

In their intellectual relations, as distinct from questions of administration and discipline, with the college, there are probably few of the problems which are presented to members of the faculty in connection with their students that do not also come within the range of the reference librarian's experience with undergraduates; they are confronted with the same conditions of mental activity or indolence, of conscientious endeavor or indifference, of brilliance or stupidity, of gratitude or resentment; they come under the like influence of personal charm or antagonism. From this point of view the reference librarian understands and sympathizes with the trials of the faculty members.

The probability is that in small classes the professor comes into a closer personal relationship with his students than does the librarian, but in the large unwieldy sections, undesirable but often inevitable, the personal relation is reduced to a minimum and these students turn to the reference librarian as their first and perhaps their last hope of succor. This much is intended to establish my right to present a brief on behalf of the student.

The student in the majority of cases is a helpless youth, at first quite adrift in a new and strange world, lost in a maze of academic routine that seems to him at once senseless and imperative; he has no standard by which to judge of relative values and his mental perspective is either greatly foreshortened or indefinitely attenuated, and he is sensitive, self-conscious and very much afraid that he may be making himself ridiculous. He is in as great need of pedagogic care as is an infant of maternal ministrations. He is nearly submerged in outlines and syllabi whose directions are as unintelligible to him as Hindustanee to the Esquimau.

It is at this point that the sympathy of the Reference Librarian swerves from the professor to the student. If the latter

is once able to overcome his timidity and awe of official nomenclature, it is the reference librarian who becomes his confidant, "his ever-present help in time of trouble—just like a lie," as a member of the faculty once flatteringly remarked to the writer. It is he, or more likely she, who guides the hapless freshman through the intricacies of that snare for the unwary, the card catalog. It is he who deciphers for the student the instructor's verbal reference which through imperfect phonetics has become transmuted on the note-book page into something that its author would never own; to the reference librarian it is almost as easy to recognize Gunga Din in the reference "Kipling's Guneen" as if it were correctly transcribed, but to the student who does not know whether that mysterious combination of letters refers to a story, an essay or a poem or whether Kipling is a statesman or a mythological character, the interpretation comes like a dispensation from Providence. Then the reference librarian goes a step farther and becomes wholeheartedly the ally of the student. Why cannot the instructor write the titles of unfamiliar assignments on the board or at least spell them out to his students and tell them that the reference will be found in the poems, if it is a poem, or in which volume of short stories, if it is a short story, the tale may be found. Of course there are members of every faculty so exact that they invariably do this as they also invariably ascertain whether a book is in the library before they make an assignment to it. Their students are exempt from much tribulation, but discounting to the fullest degree for the carelessness and inattentiveness of students the fact indubitably remains that many instructors are inexact in their references and too indolent to make the necessary inquiries at the library before they make their assignments. Why does the professor not tell the student that the Courting of Dinah Shadd is to be found in Soldiers Three, Pt. 1 of the Outward Bound edition of Kipling's works or in Life's Handicap in the Doubleday and Page edition? Because he does not know this himself and he is unwilling to take the trouble to look it up. The result is that in a class of fifty students, fifty students or such proportion of them as ever read their assignments spend from five to twenty minutes each in trying to locate this story through the entries in the catalog (where they cannot find it because volume titles only are given under collected works), or in consultation with the reference librarian. That is not economy of time on the part of the student nor efficiency on the part of the professor.

The waste is still greater when the book assigned is not in the library. My contention is that while a professor has a

right to sit in his office and arrange an academic outline of work upon subjects which he ingeniously works out as of potential interest, he has not the right to present these subjects to his classes until he has definitely ascertained through his own efforts or those of one of his assistants or through consultations with the library officials whether a given volume is in the library or whether there is available material to cover the suggested topics satisfactorily.

In one university the following subjects taken at random from a long list of equally elusive references, were recently given to a junior class as topics upon which papers of two thousand words were to be written. No bibliography was given.

1. Doctrine of interest in the writings of social and sense realists.
2. Education of the poor in American colonies.
3. Rousseau's conception of authority based upon a study of his political and social theories.
4. Social position of the teacher in colonial days.
5. Humanism in American academies.

If 1 and 3 were selected as subjects for master's theses, it would require an exceptional degree of philosophic keenness and analytical ingenuity to work them into satisfactory treatises. Nos. 2 and 4 are too limited for any one but a specialist in historical research or a person of wide and varied reading of the contemporary literature and documents to be able to work out—and even he couldn't do it. No. 5 is impossible.

In this department no effort was made to ascertain the resources of the library in these fields. The subjects were ingenious; quite evidently much time must have been spent in educing them, but for two weeks the reference librarian struggled with one despairing student after another in the effort to find some topic in the extraordinary list upon which sufficient material could be found to meet the linear requirements.

Just here we are confronted with one of the most deeply rooted fallacies of the professorial logic. Again and again, professors tell me that they know their subjects are difficult but that they want to see what their students can do with them. That is very well—within the limits of possibility; these are the limits which I desire the instructor to ascertain before he makes the assignment. But if he has not ascertained whether the material is available, and is unwilling or unable to give the student suggestions as to possible sources, then the full responsibility is thrown not upon the student but upon the reference librarian to whom the student naturally turns in

his extremity. Now this may be excellent training for that official, but what good does it do the student? Up to a certain point, quite up to the limit of his ability, I believe in making the student responsible and in making him work hard, but granting these premises, I contend that fair play demands that the instructor be informed himself as to the actual resources of the department and of the library, before an assignment is made. No intelligent student objects to doing difficult work if in the end he attains a satisfactory result, but naturally he is baffled and discouraged when he discovers, after spending several hours in the effort to find material, that there is none to be had upon his subject.

In one department an instructor year after year sends his students to the library with a list of suggested topics for themes. These are usually subjects of current interest, subjects about which students should be informed and upon which there is usually little difficulty in giving them authoritative material. But that is not enough for this instructor; it is not enough for him that his students inform themselves about the subject and write good themes; he insists that this material shall be obtained in a certain way; in short, he standardizes a process and measures his students' work by the degree of adherence to the method and not by the actual result as embodied in a creditable or discreditable theme. The students are required to obtain their information from two books and one magazine article. Literature is not produced in that way. If the subject is the "Panama Canal," the requirements may be met, but if it is the "Stamping out of Typhus fever in Servia," the library cannot meet the specifications, although it can furnish adequate information upon the subject. The instructor in question never comes to the library to ascertain the possibility of supplying the material in the required form before assigning the topics. The writer's point of view may be immoral but he believes in collecting usurious interest on every intellectual investment. While the student is gleaning the actual facts needed for the presentation of his subject, incidentally he may also be trained to form a critical standard of his own; it should be suggested to him that a whole volume upon his subject may be worthless while ten pages in some special report may be invaluable. His power of discrimination should be trained. But the method of the instructor who I am mercilessly but regretfully crucifying is to emphasize quantity and form rather than quality and authority.

Another habit, particularly disastrous in the Rhetoric Department of our institution, is the judgment of themes by the

tape-line method. The whole *raison d'etre* of a Department of Rhetoric is to teach students to use good English and to write it. The first principle of good writing is condensation, but the stipulated requirements of fifteen hundred words on a topic, when the student has but four hundred words of real information, is altogether vicious and defeats instead of furthering the object of the assignment. If the student presents a well-written theme which shows that he has grasped the essential point of his subject, what difference does it make whether he has read two volumes and one magazine article, or three magazine articles, or one official report; or whether he has delivered himself of five hundred words or three thousand? The point that should have been made clear to him is the necessity of getting the best possible information and expressing it in the clearest and briefest possible way.

A regular assignment in the Department of Economics is the tracing of a bill through Congress. A student comes to me for assistance after having selected a bill "to build a bridge across the Missouri river." I suggest that instead of this innocuous bill he take one of more vital interest and he replies, "Oh, it isn't information Prof. B——— wants us to get; it's just the method." That is probably unfair to the professor, but it shows the impression he has conveyed and illustrates the weak point of instruction in our large universities,—we fail to stimulate interest. Because a certain amount of organization and systematization is necessary in dealing with large classes, we have organized and systematized the vitality out of them; we have built up a wonderful structure, but it is empty. Can we not break away from this fetish of standardization and fan the faint vital spark in our student's minds into a blazing flame even if we do it with an old newspaper instead of with the latest improved electrical contrivance for starting pyrotechnics? The time of students should be conserved as carefully as that of the instructional force, and a possible by-product of academic training, more valuable than the mere acquisition of fleeting knowledge, would be the training in method, in accuracy, in clear perception of the objective point in every course and in the awakening of a realizing sense as to what may be the shortest distance to a given point of knowledge.

The writer fully realizes that the path of an instructor is not strewn with roses. A learned and witty Yale professor used to say that "the longer he taught he more he was amazed at the ability of the student mind to resist the intrusion of knowledge." The student mind is often an adamantine wall. The professor is frequently confronted with mediocre ability,

with poor preparatory work, with apathetic interest, with unresponsiveness, with every kind of discouragement in his sincere effort to get good work out of his classes. He is harassed by continual calls upon his time and patience in relation to administrative committees; he is supposed to be always ready to lecture before the local clubs at short notice and for no pay, and he has the legitimate desire to appear in the much overcrowded domain of "research" work. Like every other man he has his personal problem of living on twenty-fours a day to solve. But granting all these things they are still but the attendant defects of his chosen calling; they are as much a part of it as is the mosquito of the summer evening. The canker comes with the rose, the evil with the good, and when all is summed up the first and last duty of the instructor is to instruct.

I do not expect the members of the faculty to understand the details of the mechanism of library work. The library officials are there to give expert help and direction in the use of professional tools. I even go much farther and differ from many of my colleagues in believing that the time of students and members of the faculty should be saved as far as possible by having assistants ever ready to give help and direction in the most ordinary use of catalogs and indexes. The theory of self-help is very beautiful if the efficiency developed is going to be a permanent gain to the individual, but if there is some one who knows how to look up a reference in two minutes, why waste twenty minutes of another person's time in doing that mechanical thing laboriously, when he might be doing something else expertly with those precious minutes? Of course the defensive argument is that the student will very quickly develop skill in finding references but my observation is that the majority of students never develop any real expertness in the use of a catalog. There is one genial and able head of an important department in our college, who habitually comes to me for help in looking up books. "I can't use a card catalog," he humbly says. That is quite right; I am glad to help him; he knows how to do many things that I cannot do. The catalog which is my hourly salvation is to him a monstrous and mysterious thing, and my observation leads me to believe that to a greater or less degree most people, even habitual users of the library, share his lack of skill in handling this necessary but complicated instrument of library economy.

Ignoring the inflammatory subject of research,—the question as to whether a university exists primarily for the development of its faculty or of its students, I think every one

will agree that at least a small proportion of the time of the occupant of an academic chair should be given to the instruction of students. That being conceded, it ought to be equally obvious that the efforts of the faculty should be directed toward supplying the student with the maximum amount of knowledge or rather with the best equipment for gathering knowledge, with the minimum waste of time.

My quarrel, as far as I have one, with certain faculty members is that their instruction is not clear cut, and that they lack physical activity; they hate the trouble it takes to leave their comfortable offices and go to the library to verify their references; they hate even to take the matter up with an assistant or a library attendant; they are too willing to let their students take their chances of finding material on the subjects they have selected or invented. Secretly they consider those subjects very clever and when their selection of topics is challenged by the reference librarian, they are surprised and annoyed and usually intimate that the trouble is with the library and not with the subjects. I would be the first to concede my own fallibility and the inadequacy of the collection of books over which I have subordinate charge, but these limitations are what the professor should acquaint himself with. Too frequently he ignores them.

THE THEORETICAL GARY[1]

By William L. Dealey, Clark University

The brilliant and extensive literature descriptive of Gary, even apart from the system itself, has created an "abstraction" of high significance to educational practice. This system, according to Snedden, in its underlying theory, in its plans, and certainly to a large extent in its practice, meets the needs of city children. With Dewey, its introduction is the most momentous question before New York citizens. Bourne in his Gary essays adds that Montessori seems almost a beginner so daringly has Wirt carried the principles of self-instruction up through the higher grades. To Taylor, Gary is "the most remarkable educational experiment the world has seen since Pestalozzi."

The city itself is typical through its immediate contact with Chicago, its pressing immigrant and labor problems. Wirt not only pays city prices and relies on ordinary teachers, but had further to accommodate an extraordinary nine-year growth in population from 300 to 40,000. Emerson and Froebel Schools, costing some $600,000, now with 2,742 pupils (nearly 60 per cent. the present Gary enrollment), essentially represent the Gary "plan." These two school plants, Curtis and Bourne think unsurpassed, and according to Bobbitt, they are thoroughly modern.

The administrative machinery is surprisingly small: the educational engineer in charge is Wirt, plus an efficient school board of three, a supervisor of academic and another of industrial work, and a principal as executive head in each of five buildings.

Emerson and Froebel employ a staff of 88 teachers for 5-6 hours daily, including 1 hour of auditorium. Though grade teachers still average 30 pupils, the high school average has been reduced to nearly 20. As time may be equally divided between recitation and study, there is no home-work.

[1] This study is a digest of the Gary literature, especially articles by Allen, Baker, Bobbitt, Bourne, Burris, Churchill, Coons, Curtis, Dean, Dewey, Ettinger, Fernandez, Hartwell, Johnson, Klapper, Lane, Nock, Nudd, Prendergast, Smith, Snedden, Spaulding, Starbuck, Taylor, Wirth, and Wulfing.

New-coming teachers learn as apprentices to older teachers, who are also encouraged to experiment in details of courses. Play supervisors teach 7, practical shop instructors 8 hours.

These plants are operated by scientific management, for a maximum of service. Their fundamental economy uses all the plant all the available time. The Gary double-unit plan[2] houses two duplicate organizations in one set of school accommodations. One building thus contains two independent schools, one from 8 to 3, the other from 9 to 4. The total school divides into four groups, and school activities into the four departments of academic; second, science, manual arts, drawing, music; third, auditorium; fourth, physical training and play application. With one school in departments "one" and "two," the alternate school is in departments "three" and "four." Thus four separate classes use each regular classroom daily, doubling the net capacity of the plant. The absurd theory of a seat for every pupil and the same work for all is effectively discarded. A desk is only a tool, to be used when needed. Estimating cost at $8,000 a classroom, this saves in a 24-classroom building nearly $100,000.

The usual overhead charge of idle plants is further eliminated by an all-year school, with two months voluntary; by an eight-hour school, with at least 4 hours compulsory; by Saturday school, for voluntary work and play. This additional time is substituted for the former waste in "street and alley" time. This waste is further avoided by 4 evening sessions in continuation school and social center activities, and a Sunday social center.

Not only is there no scandalous overhead, but the number of workers is reduced to a minimum by keeping each at his maximum efficiency. Special activities call for specialists, or a departmental system. The objection to departmentalization of the lowest grades is met by having one or at most two teachers for the regular subjects. With specialists for special subjects, that curious and expensive anomaly, the "supervising" teacher under whom teachers try to teach things they scarcely know, is eliminated.

In addition to maximum use of the school plant, and possible maximum teaching efficiency, there is an important economy in charging the budget for the shops to maintenance. The pupils, apprenticed to regular workmen selected for skill and teaching ability, equip and repair the school plants. For example, in 1912, three printing, cabinet and painting shops,

[2] Hartwell '16 describes the adaptation of this device to a large Cleveland school as the "platoon" plan.

with 105 pupils, totaled credits of over $7,000 Any surplus is used for a new shop.

There are unexpected economies from grouping other city departments, such as parks and playgrounds, about the schools. The attendance at 11 recreation centers in Chicago, at a cost of two million, for example, is equalled by the Emerson school.

The saving from these various economies is so great, Gary, with relatively meagre revenues, can afford varied modern equipment and special teachers. The total per capita cost of each of the 4 departments is from $140 to $400, or from 40 to 100 per cent. greater than for a regular classroom, but as the new school may accommodate 4 times as many, the actual per capita cost is only $35-$100, says Wirt. Spaulding cites the average Gary salary as $850; Taylor as $892; Burris in 1913, as $935.[3] Spaulding however estimates the total current expense per pupil in Gary as $46 to Minneapolis' $44. Taylor concludes the cost of the day schools alone is $36, but of all day, evening and holiday activities, as $55. Curtis cites Gary as $40, and Chicago as $43.

Spaulding would then add $12 per capita interest on investment, and $10 for increase in salaries due to increased day, and conclude that Minneapolis schools Garyized would cost one-third more. This is most unfair, as the "increased" day is but one auditorium hour, for which the presence of the class usually suffices; while the Gary plant is far behind its full capacity, although running evenings and holidays and actually caring for more adults than children. In fact, Nudd by allowing for these and other factors, concludes Minneapolis schools Garyized would cost less per pupil. It would have been more reasonable to have compared this theoretical application to Minneapolis with the theoretical possibilities of the Gary plan. Burris, in such a theoretical estimate, compared the Jefferson as a traditional school with the Emerson, 1908, and found a per capita cost superiority of the Gary plan of $35 to $62; and in cost of construction, of $125 to $225.

The Gary system, therefore, is not a cheap system; its median is above rather than below the median for the country. Wirt is "not specially interested in running school systems cheaply," but in the disposition of the economies secured.

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[3] According to Smith, tables for Indiana's 25 largest cities (Giles '16) show only 54 per cent of the Gary expenditures for elementary schools used for teaching purposes, yet but one other city (Indianapolis) has a higher salary scale for elementary teachers, supervisors, or principals. Elementary teachers average $4.85 daily. Similarly in the high schools only 87 per cent of the expenditures are for teaching, yet these teachers are the best paid in the State, averaging $6.74 daily.

The disposition of these economies is in equipment for the lengthened day, and added auditorium, libraries, art and music studios, science laboratories, and a fine equipment of workshops, printing, electrical, machine, pattern, forging, molding shops, painting departments, metal work rooms, also four gymnasiums and three swimming pools, and some twenty surrounding acres. A school farm serves for excursions and agricultural demonstration.

The departmental schedule allows the expert use of these varied opportunities through the subdivision of groups for shops and laboratories. After meeting for the academic subjects, the class may divide into 4 parts in special science or art classes, for example; may again unite and join other classes for play or library work; or again divide into still smaller groups for intensive work with shop men. Such a flexible schedule allows any grouping from 4 to 400 according to aim, while the eight-hour day reinforces 2 hours classroom, by 2 hours in shops, laboratories and studios, 1 in the auditorium, 2 in application, play or physical training.

The essential advantage of this system is sufficient flexibility to work up the raw material through these opportunities into the finished product for which it is best adapted. Life is not divided into inelastic grades and retardation. Promotion is generally by subjects, transfer is informal. Classes work in "rapid," "average" or "slow" groups, completing the state-prescribed curriculum in 10, 12 or 14 years. The pupil may pass from group to group or grade to grade at any time, on examination by the supervisor. The child long absent, or weak in any subject, takes these lessons with both schools or even a grade below, without disturbing the routine because substituted in department four or Saturday or vacation time. The new-coming foreigner, for example, may thus concentrate on English. Or the distinctly backward child does what he can in the special activities. Significant of this flexibility is the physically weak child, who may spend most or all his time in supervised out-door play gaining strength to do the regular work. Thus unless a child be defective, there is no need for special schools, as "the flexibility of the program in the Gary schools, with its alternation of regular studies and special activities . . . each in progress the whole day long, makes it possible to adapt the program to the pupil." Every child may select an individual schedule.

In addition to flexible promotion, segregation of sexes has resulted simply from adaptation to individual needs. Organization for play, the pool, personal hygiene, and applied activi-

ties, required a unisexual classification, then retained throughout to avoid breaking classes.

More striking still is the interweaving of this flexibility into a unit-system through class correlation. Personal hygiene, for example, is taught by teachers of biology and physical culture co-operatively. Similarly, the playground teachers supplement the arithmetic work with games involving mathematics, and literature with dramatization work. Or again, teachers of botany, physics, and sewing for 7th and 9th girls, meet and plan their work with teachers of zoology, physiology, chemistry and cooking for 6th, 8th and 10th girls. The botany class' study of food and textile products ramifies into the domestic science work, just as zoology study fuses with physiology. Or again, arithmetic classes do problems for their carpentry class, and English classes emphasize things pupils need to know in the printing shop, punctuation, paragraphing, spelling. Laboratory and shop teachers have definite periods to instruct in mathematics and English.

The motive of Gary should always be social, recognizing the greater importance of an intimate correlation between the school and life. French in the 3d, German in the 7th, utilize conversation methods. Classes in geography and history are gaining an imaginative background of the larger social world; clippings brought to the news-board, maps, charts, mostly made by the children, fairly smother the history laboratory. Bourne found a class studying "the city as a healthful place to live in," with special emphasis on parks, because of the town campaign for a new water-front park. Little outlines of Greek and Roman, mediaeval and modern cities, had been worked up. Another class was comparing Athenian and Spartan education with Gary education. This class has formed a voluntary society, conducted by its child president, "to improve its members as American citizens by a study of the experiences of the ancient peoples." Or again, the 9th grade English class is organized as the Emerson Improvement Association.

Science teaching is commenced early in the grades, in 7 different laboratories. General information, not laboratory manipulation, is the aim, so experiments are performed by class demonstration, under group stimulus. The Emerson school has an elaborate conservatory at its entrance, and window hot-houses in the botany room, where various grades care for plants. These botanists have charge of the school grounds and vegetable gardens. Similarly for zoology, the playground zoo contains foxes, coyotes, raccoons and prairie-dogs, upon whose habits and adventures the children have prepared a

pamphlet. In the laboratory itself, Bourne found crows, chickens, pigeons, and concludes, the imperturbability of the children amid this racket showed this was the way a zoology room ought to behave.

Gary frankly accepts the machine as the basis of modern life, and it is with the child from his earliest years. Bourne describes a physics class of twelve 12-year-old girls and their 9-year-old helpers, studying the motor-cycle. The instructor began with a spelling lesson on the parts and processes, then explained the mechanism and physical principles involved, finally starting the motor-cycle, while the girls described its action. "The intense animation of that little group was all the more piquant for having as a background the astounded disapprobation of three grave school superintendents from the East." Taylor saw a class working on ventilation data; the upper grades, also, are able to enter a house and plan a complete heating system. The physics laboratories are elaborately equipped, with three large rooms in Emerson, plus the lighting and power plant.

Chemistry is related to industry, the home, the school lunch room. Graduates of the laboratory are able at once to earn $80 a month in the research laboratories of the Steel Corporation. Coons cites the erection of a crucible by the boys to reduce a sample of bog iron brought in by a curious boy, as a starting point for the steel and iron industries of Gary. Taylor instances a class on the basis of whose analysis of coal for the schools, payment was made. The Emerson laboratory is simply an extension of the municipal chemist's laboratory. Older children act as his assistants testing city water and milk supplies; his children are practically deputy food inspectors, visiting dairies, bakeries and food-shops. Bourne found another class experimenting with soft drinks, studying questions of solution, suspension and crystallization. The bacteriology laboratory is equipped for testing food products and contagious diseases; while the school physician has his own laboratory, and students are assigned to work with him. Through auditorium, chemistry and physiology, he explains the laws of health. When a classmate is sick, the children see that quarantine is enforced.

In the arts, Taylor describes a studio for orchestra, piano, correlated vocal work, and special library. Instrumental music is part of the curricula for six per cent. forming nine school orchestras, inclusive of evening schools. The art work includes jewelry design, pottery design, drawing applied to the shops and laboratories; in one studio, children were decorating the walls.

Probably the most successful solution of the practical arts course is the Gary vocational guidance plan. This extension of the manual training system to Burris is the "best yet devised." Gary places practical instruction, Snedden adds, on a much more satisfactory basis "than anything heretofore existing outside of individual schools." Every bit of practical work for the entire school plant is made an educational opportunity, providing prevocational industrial and commercial experiences at small cost. The school thereby organizes itself as a community of children varied in its work.

The basis is laid in the elementary school. The first three grades devote an hour daily to simple hand-work, learning to handle materials much as primitive people used them. Fourth and 5th grade children assist the older in shops and drawing rooms. The junior high school organization here extends to the 6th grade, where actual work is begun, as responsible apprentices in some shop, utilizing the earlier experiences to definite ends. These small shop classes resemble individual instruction, thus emphasizing the guidance element. The Gary pupil may change his shop every five weeks; he must change at least twice a year. As a responsible worker, rotating through three shop courses a year, living for two hours a day in the rudiments of many occupations, he tests his abilities. On leaving he has definite attitudes, encouraged by instruction in the possibilities of various trades. Gary averages nearly 3 hours such training per day for each boy 14 years or over. These schools are now working toward an advanced part-time system. By requiring attendance upon any three of the four quarters in an all-school year, the vacation workers may be distributed evenly through the year. This would add a school quarter of practical work, and continuously utilize the shops and industries of Gary as real-life laboratories, at no increased expenditure.[4]

Under such conditions, says Bourne, manual training assumes new meaning, interested groups cooperating as in a well-ordered factory. In the carpentry shop Taylor found youngsters so small they could scarcely see the top of the work bench making things either practical or of play utility. Boys making desks or tables or cabinets for the botany collections, or book-racks for the library, send them on to the paint-shop when finished. Only boys of 16 are allowed in

[4] Many of the older children are already encouraged to accept positions, says Smith, returning to vacation schools to make up their work, so that the ratio of average daily attendance to total enrollment is only 76 per cent; while at the same time, Giles '16 found only one other Indiana city with a higher daily attendance in proportion to population.

the cabinet shop. The children turn their own baseball bats as well as shop patterns. In the turning room, Taylor saw a 13-year-old 8th grade pupil turning a laboratory stool, its base cast in the school foundry. In the blacksmith shop, a 5th grade boy was mending his roller skates; while all forged iron work in the elaborate playground equipment is made here. The American Bridge Company manufactured the charging platforms for the foundry from specifications drawn in the drafting room. The Emerson machine shop for children above the 7th has some $8,000 worth of equipment. Bourne found boys in the sheet-metal shop hammering zinc for the roof; they manufacture the school utensils. Young electricians were repairing. Several of the plumbing shops possess extensive equipment. The shoeless condition of some of the Froebel children has led to a cobbling shop. The printing shop is as well equipped as a commercial printer, teaches the whole art of printing and bookbinding, and does all the school work.

Many of the girls in the advanced grades not only study home-making, but are in millinery or arts and crafts or printing, others in the school store and school bank, both actual business departments. The Emerson school office, for example, does all the school accounting, sufficient to keep some 10 pupils busy daily, and gives pre-commercial experiences to about 120. The store-rooms are included, so that accurate records of supplies and costs are kept. This work includes stenography, typewriting and business methods. These girls also have a sewing room, in which to make their own clothes. Another excellent illustration is the school lunch room of the cooking department, serving real lunches to students who pay a student cashier. The girls do all the planning, buying, and accounting. They post daily menus, with prices and food values, based on chemical laboratory analyses.

Clearly, the Gary school is organized as a community, self-supporting industrially and varied as is the larger community. Play is therefore an integral part of the curriculum. "Gary," says Curtis, "perhaps comes the nearest of any city to a real solution of the play problem of her children." She has attained nearly maximum and uniform attendance at her playgrounds at all hours. The Emerson playground, through electric lighting at a cost of only $1.50 an evening, is used 12 hours a day, whereas municipal playground attendance is very irregular, the facilities being in turn excessive and inadequate, averaging 1 hour. The standard playground at Froebel is 20 acres, half belonging to the park department. The grounds include hand-ball, basket-ball and tennis courts (with regular class instruction), sand pits, wading pools, al-

most every form of all-steel apparatus, in short the most complete equipment Curtis has yet found. The field includes a circular and straightaway track, baseball and football space. The swimming pools at Emerson are used twice a week by the boys, once by the girls wearing undyed one-piece suits made in the sewing room. Froebel, apart from its two gymnasiums, has a stage some eighty feet square used for basketball, drills and exhibitions. Physical training commences in the first grade.

It should already be apparent that the Gary school is an organic unit-system, a synthesis of educational influences such as "playground, garden, workshop, social center, library, and traditional school." Its synthesis is heightened by placing all 12 grades in one building. Not only are completely equipped centers cheaper than duplication in smaller centers, but the younger grades may thus use shops and laboratories otherwise extravagant.[5] Children of all ages go freely everywhere in the building. Fourth grade children, for example, observe the older in chemistry, zoology and cooking; fifth grade children in physics, botany and sewing, developing new interests. Older children may clarify their ideas by explaining to younger. This process is heightened by distributing shops, studios, and laboratories over the building as equally significant, and using big glass doors and windows. The very corridors are most spacious, and lined with art and museum collections. Under such a communal existence any gap between elementary and high school simply is non-existent.

Gary is further a "school-community of itself" through a "forum" or auditorium, where "everything that is peculiarly interesting in any part of the school" may be brought dramatically to the attention of all. It gives motive to the entire school program, and molds public opinion. Discipline is as free as in any adult meeting. It is conducted by the children, in large units, under a teacher's direction. Taylor saw 6th grade English compositions on table manners staged, with children taking the parts. Motion or lantern pictures, exhibitions, choral or instrumental music, may succeed dramatic dialogues written from history or literature, or an older grade may tell of a physics experiment, or a cooking class of a cheap, nutritious bill of fare, or special teachers of their work.

[5] As a result there is a more equitable division of funds at Gary than is usually obtained, for as Giles '16 shows, the average daily attendance in Gary high schools is 10.5 per cent that of the grades, while the expenditure for high schools is 13 per cent that for the grades.

Such activities leave no other interpretation than that constructive self-activity in real life situations is coming to form the basis of Gary. Freely reacting to numerous opportunities, Gary children gladly learn by doing every day in the year. The Syracuse report refers to their happy appearance. They "run or skip, talk or whistle in the halls and other sacred precincts of the school exactly as they would in their own homes." Bourne says the children unaffectedly own the school. Their affairs are controlled by an elective students' council.

One device remains for emphasis, the application period. "This period is definitely planned to give the formal work of the school expression through self-activity." It may be used for library reading; for games requiring practice in number or language. Music and literature teachers may introduce folk dances, musical games and dramatics. Taylor describes such a period in the lower grades, 3d year, not as a class exercise, but a period in which the children walked around the room, talked freely, some had nature study, some modeled, some sewed. In the upper grades, the workshops and laboratories furnish the best opportunity for application work.

But the application period need not merely supplement school work. It may extend into outside child-welfare activities, for the school alone cannot afford the child a complete life. Wirt does not regard his institutions as "schools" at all, but as "opportunity centers." He would have library, church, home, playground, park, museum, private studio, theatre, club, press, shop, police, unite in Gary to construct a new type of municipal institution to which they all contribute. It is necessary to suppose public library, art galleries, museums and public parks administered as parts of unit plants, to appreciate this plan whereby Wirt seeks to integrate the facilities a city should provide for the welfare of its people. Whenever any agency is equivalent to the school work so displaced, it may be substituted. Each class, for example, spends a part of department four time in the public library, where thousands of volumes are classified by grades for supplementary reading. Or the application period may utilize the neighboring Y. M. C. A. for gymnasium or lecture, or a private music studio, or Boy Scout activities. "The school with such programs thus becomes a clearing-house for the other child welfare agencies of the neighborhood."

The best known feature of this cooperative device enables various churches to take groups of children for religious instruction, at the parents' request, 2 weekly periods. Attendance is voluntary, but reaches nearly 80 per cent. under 5 paid

religious teachers. New York has formed an Interdenominational Committee representing 18 Protestant, Catholic and Jewish bodies to take advantage of similar opportunities. Its greatest significance may lie in a gradual substitution for the Catholic parochial school.

The school definitely unites with home and neighborhood social work, by making each teacher personally responsible for the children in a district of some fifty families. In addition to a careful social history on entrance, and measurements of his home by each child, the children make every grade teacher a complete map locating every house in her district. If conditions are very bad, neighborhood public opinion is worked up through other children on the block. From time to time good and bad features are pointed out in the auditorium. Gary is thus advancing toward a "special department of social service as an intrinsic part of the school organization."

It would be surprising if such schools were not public property in the fullest sense. According to Burris, they are using all the educational opportunities of the city, all the time, for all the people, in a way which reveals to young and old that what they are doing is worth while. It is readily seen that such completely equipped shops and laboratories, auditoriums, social rooms, pools, gymnasiums and playgrounds, afford also a complete social and recreation center for adults. Sundays included, entire families attend meetings in Froebel. Seventeen hundred men attend evening school, and the total enrollment is 6,000, for anyone may go and "learn anything he wants to know or do." Thus Gary schools inseparably weave themselves into the lives of both parents and children.

The novelty of Gary is the synthesis and the democratic idea that motivates it. There is no reason why other systems should not undertake one or all of these profoundly suggestive devices. Their most remarkable application is in New York, a city presenting one of the most formidable school problems in the country, in rapid growth, alien population and political cross-currents. The seriousness of its situation appears in 141,360 elementary school children on part-time, September, 1915. The adaptation of the Gary system to School No. 89, Brooklyn, solved one of the most difficult part-time problems in the city, with an improved curriculum. Wirt found 40 classes and only 26 rooms, but through duplicate schools was able to set aside 5 rooms for special subjects and introduce a 6-hour day. Its adaptation to a Bronx school, No. 45, with 2,700 in 3,065 children on a 4-hour day, immediately placed, says Taylor, 1,629 on a 5-hour and 1,431 on a 6.3-hour schedule. Seventy-two classes then required

but 54 regular teachers, 4 for auditorium work, releasing 14 teaching positions to specialists in art, science and vocational work. The auditorium is used by 3,000 children, 40 minutes, daily. Play involves the continuous use of sadly cramped space. The former rigid discipline has disappeared.

On the basis of these experiments, the Board of Estimate allowed $620,000 to reorganize on the Gary plan 12 Bronx schools, eliminating a most acute part-time situation, 35,580 children registered, and sittings for only 25,331. In place of 583 classrooms for 779 classes, the Gary plan will accommodate 1,022 classes, a total of 46,000 children. These children will receive daily, 380 minutes in place of 300; the upper grades 80 minutes in academic work; 40, play; 40, auditorium; 60, luncheon; 140, academic, and 80 in drawing, science and shopwork. Sixty-three prevocational shops with special equipment are included. In April, the Board of Education voted to extend the Gary plan to approximately 100,000 more pupils, at nearly $3,848,000.

The New York school budget, 1915-16, increased more than $4,000,000, largely by increased registration; while traditional estimates approximate an additional 40 million, to eliminate the part-time evil. In contrast, by an expenditure of 6 million for structural changes, annexes and play space, Wirt estimates a six-hour day and superior facilities to all children.

The New York Ettinger plan has been confused with the Gary system, but is essentially a device for securing prevocational experiences to older pupils. There are some 9 prevocational schools, including woodwork, machine shop, sheet-metal work, plumbing, electric wiring, printing, bookbinding, sign-painting, trade drawing, garment designing, power-machine operating for girls, dressmaking, millinery, pasting and novelty work, and home-making. School No. 64, for example, has some 10 shops. Vocational guidance consists in rotating these industrial classes, 10 weeks in each shop, until marked aptitude is shown. Their rigid separation from the regular school forces 7th grade children to choose between extremes of too much academic or too much vocational work, and results in an undemocratic class division. The academic work is no longer vitalized by the vocational motive. Wirt aptly refers to these schools as special vocational hospitals, repairing the mental and industrial cripples made by six years of maladjusted, traditional schooling. In no sense do they substitute for the complete reorganization implied in the Gary plan.

Buckingham, '15 examined at an interval of three months the 2 Gary schools, 6 Ettinger prevocational schools and se-

lected traditional schools. He found comparative percentages, Gary, 49.1; prevocational, 54.0; traditional, 57.7; while percentages of improved pupils were 40.7, 47.6, 54.3. As Allen points out, this is a clear misuse of averages to "smooth out" facts. Six schools averaged as having improved, actually lost in 8 subjects, 4 others gained less than 1 per cent. in 5 subjects. Comparing 2 with 8 allows one low school to reduce the Gary average 4 times as rapidly. Nor were there scientific controls such as evidence that the schools were comparable. Buckingham seems to assume that six years' previous experience in traditional schools would not affect three months' training in a Gary school. In fact the lower Gary school had been on a traditional basis until 3 weeks before the first test. This Bronx school had suffered acutely from part-time and was undergoing readjustment, with chiefly Italian pupils. To it was compared a traditional Bronx school, No. 46, with native children from well-to-do-homes, on full-time, in settled classes. Yet the latter improved 0.3 per cent. and the Gary school 4.2 per cent. Facts given for each of the schools show the highest Gary school actually excelled the traditional schools in improvement 22 out of 40 possible times; in history, for example, this school excelled 7 of the 8 traditional, in geography, 6. In the final test, the highest Gary school outranked one or more traditional schools in all subjects. To disparage the Gary plan on this basis is highly objectionable. These are tests of traditional academic subjects: spelling, arithmetic, history, geography, formal grammar, and so decidedly inadequate for gaging the special modern activities of the Gary system.

Various progressive cities are including similar experiments. Two Newark schools have been reorganized, the Cleveland School, with some 2,000 pupils, replacing 35 classes by 51; grammar pupils receiving 80 minutes daily in science or shop, 40 in play, auditorium, and a 6-hour day. Troy's Central School, organized by Wirt on the Gary plan, secures, says the superintendent, "far better training" for the children. Passaic has adopted both the framework and spirit as expressed in a new, specially designed plant. Pittsburgh is developing a "Gary" school, or again, the progressive Bridgham School in Providence is moving in this direction. Such random illustrations show the trend.

From the evolutionary standpoint, "the Gary system is such a live, growing organism, and has within itself such a capacity for intensive readjustment its scope can be easily modified to make room for whatever developments its growth may de-

mand . . . a real experimental school system in the larger sense, flexible, but not unstable, free, but not unorganized." Compared with this moving equilibrium, the average static school system should be rated an experimental failure. Though Gary is frankly an experiment in process of development, in the present state of educational theory, so is every school system. In spite of the apparent looseness of the actual Gary, it is possible to build up from the extensive literature this abstraction of the ideal theoretical Gary.

THE ARROW-BOARD, AN ADULT "FORM-BOARD" TEST

By Francis L. Dunham, Phipps Psychiatric Clinic, Johns Hopkins University

Clinical tests of intelligence resulting from the active ingenuity of investigators now quite outnumber the individuals to be tested. So seldom do they fulfill a technical need that one hesitates to add another object to an already overcrowded armamentarium.

As a means of teaching and of testing immature children the standard Form-Board has met with approval. This may be judged from the following comments: "No other test shows so much about the child's condition in so short a time." (1) "For a simple test the Form-Board is unexcelled as a valuable and reliable aid in testing mentality."(3) "One of the best tests rapidly to distinguish between the feeble-minded and the normal child."(2) "A useful measure of the ability to deal quickly and well with a new situation."(6) "A very good test of native ability, form perception and motor response."(4) "It very quickly gives the experimenter a general idea of the child's powers of recognition, discrimination, memory and coordination and leads to a conclusion as to his ability to learn."(5) "A mental test whose solution does not depend on readiness in the use of speech is a very meritorious one. We are as a rule too much inclined to identify control of verbal expression with intelligence, an inference that is often false." (8)

The utility of the standard Form-Board, however, is confined largely to investigations upon young subjects and to teaching form perception to defectives. With older children and adults the same factors may be observed when the test is carried out blindfolded, otherwise it degenerates into a mere exhibition of speed and coördination of movements. In any case it is of little value as a measure of method and of capacity in learning. Sylvester, whose monograph on the subject is an adequate study, developed a method of technic and a standard time-index for children from five to twelve years of age. The latter factor is considered the most important one to be observed because of its convenient application and its content

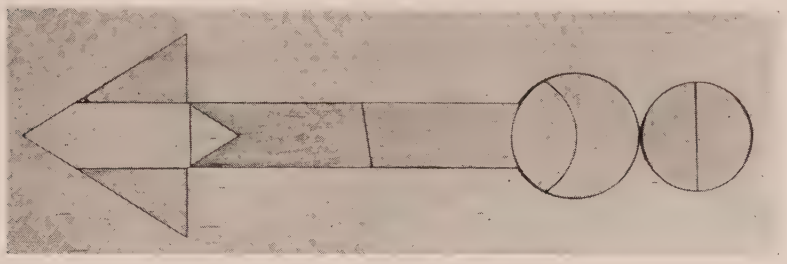
of elements capable of further analysis. While the test may reveal to some extent the native endowment in respect to a primitive process of learning, yet there is little complexity in the situation. A clue to the child's reactive behaviour and his ability to give attention may be observed in many cases, but the most easily available process is the discrimination of simple forms such as circles and rectangular figures.

Various modifications of the test adapting it to the more complex situation in older subjects have been attempted. The results have been largely a variety of puzzles and of dissected picture games. Some have been adopted as members of co-ordinated systems of test scales, but so far as the writer knows there has been no attempt made to standardize a Form-Board in respect to its time-index for more mature subjects.

The original Form-Boards, developed by Seguin in 1846, are still in use as a part of the educational apparatus for training defective children in the school at Waverly, Mass. They are constructed according to the principle that "our application of the shape of everything in nature has its foundation in the knowledge of a few typical forms to which we refer as matrices for comparison. The simplest of these are circles, squares and triangles, adapting themselves to their corresponding forms and to no others." (7) Thus the curve is first exhibited and a discrimination in size of circles is developed. The crescent is next shown and developed in size, then rectangular figures and finally triangles, which present the most difficult problem for solution.

Starting from these fundamental observations the Form-Board here described, which is called the Arrow-Board, has evolved. It begins with a problem in the size discrimination of simple circles. This is next complicated by building up the circles from crescentic material. A fragment of the circle is retained in the transition to quadrilateral figures. Various combinations of simple lines are presented as the more difficult angle discriminations are developed into a consistent figure of easy recognition. Thus the simple problem of the standard Form-Board is here demonstrated and in addition the development and solution of a complex situation are offered to the subject. Not only does the fundamental process of learning by trial and error appear in the procedure but the object to be created may stand out clearly enough in consciousness to result in a marked effort at planning ahead. The higher type of insight is frequently observed in subjects whose clear visual image of the completed circles stimulates an effort to arrange the blocks before placing them in the appropriate recesses. The ability to learn intelligently, to profit by experience and

to apply the results obtained from one solution to the examination of another problem is well brought out in the development of the various triangles composing the Arrow-Head. These blocks, numbers nine and ten, were suggested by Binet's "Game of Patience," (9) a test requiring an arrangement of triangles in the nature of a game and at the same time demanding an intelligent manipulation of them with an analytical comprehension and retention in memory of the end to be attained. Under this directing idea trial and error are often guided unconsciously while judgment of the combination formed and comparison in respect to a correct solution are also brought out. Several inadequate solutions are sufficiently developed to lure the subject from the true problem and thus exercise his ingenuity and judgment in returning to the right path.



ARROW-BOARD WITH BLOCKS IN PLACE

The Arrow-Board is presented as a test of mature intelligence. From it one may judge of the subject's efficiency in form perception, in giving attention, in judgment, in insight and in memory. Furthermore it brings out the individual's poise and coördination as well as his behaviour in manual dexterity. A time-index is developed for mature normal boys and girls. This index is presented in the belief that a standard time for each year of chronological age is impossible in either the Form-Board or the Arrow-Board. The actual time of solution can be applied to groups only. The group here presented is that of the usual high-school age. The results shown indicate the application of the Arrow-Board to ninety-nine high-school boys, mostly of the third and fourth year grades, attending the commercial and academic departments of the Baltimore City College, and to eighty-five high-school girls, of the same grades in the commercial and academic departments of the Eastern High School of Baltimore. Their chronological age ranged from fifteen to eighteen years inclusive and each subject was accounted of the age nearest

to which his or her birthday occurred. There was a racial variety, German, French, Polish, Hebrew and American children being represented. Most of these were born in America and all spoke English as their mother tongue. As a group they were all of average or high intellectual measure and reacted freely and with much interest in the results. There were not more than six who gave evidence of neurotic trends, and there were only four who appeared of defective physique. Each individual was examined alone, coming from class work and returning directly, so that there was no coöperation between subjects. The board was placed on a low table so that the subject seated opposite the observer could look down upon the blocks at a convenient visual angle. The test was in place and the blocks in three piles on the side opposite the subject as he seated himself for the task, no block being near its appropriate recess. The subject was directed thus: "Fit these blocks into the board. If you place them correctly they go in very easily and if a block almost fits, but not quite, you may know at once that you have made a mistake. Now begin." Three trials were given. During the first the subject became familiar with the problem. He learned it to his own satisfaction by trial and error or better. The blocks were then removed and rearranged as before by the observer and the subject was directed thus: "Do it now as quickly as you can. I will keep account of the time. Ready." A stop-watch was of course used and a second similar trial given. The standard time-index was computed from the average of these two timed trials. While the subject was engaged in his first attempt a record was made of his insight, coördination, poise and in the use of one or both hands. No suggestion as to the latter was volunteered. A record was also kept of the comparative difficulty of each block. A separate record was kept of the academic and the commercial students; the average time difference, however, was under two seconds and was not considered of sufficient importance to be differentiated in the final results. The same consideration applied to sex difference, the variation being about two and a half seconds. In respect to age difference the results showed no definite superiority of the eighteen-year-old subject over those of fifteen years old.

Nearly all the subjects reacted intelligently to the circles. Those who fumbled them were later observed invariably to have little insight. The majority met with various errors among the triangles and only found the solution after several trials. An occasional subject whose insight was superlative distinguished at once the linear inequality of block seven.

Such a record shows on the card of A. M., aged fifteen years, and one finds his time-index was, for the two trials, twenty and fifteen seconds respectively. Forty-five subjects found unusual difficulty in solving the triangles. Irrespective of the latter forty-five had difficulty with block number seven, seven did not speedily distinguish the dissimilarity in size of the circles and four met with ill success in placing all the blocks. Such an one, taken at random, was L. H., whose time-record for the first trial was one hundred and twenty-eight seconds. Among the boys ninety-two were ambidextrous, four used the right hand only, one the left only, two alternated between right and left. Of the girls sixty-three were ambidextrous, sixteen used the right hand only, three the left only and three alternated.

Of one hundred and eighty-four subjects the mean time-index was 35.7 seconds and the mean variation was 8.5 seconds. The ability to learn in school was distinctly correlated with the Arrow-Board ability in nearly every case.

A detailed account of the various trials is given in the following descriptive tables:

Boys

Age in yrs.	No. Tested.	1st trial, seconds.	2nd trial, seconds.	Avg.
15	22	39.	31.8	35.4
16	23	44.7	31.2	37.9
17	28	33.5	28.	30.8
18	26	38.	29.9	33.9

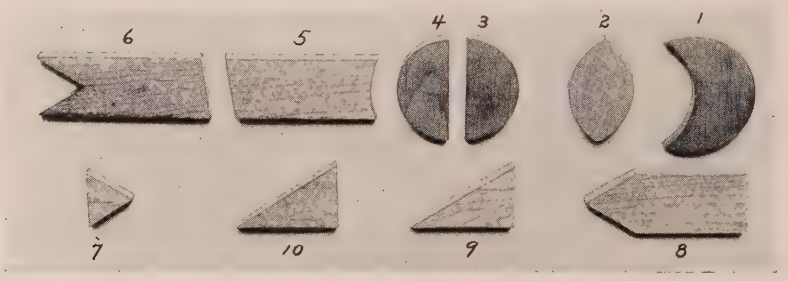
Girls

Age in yrs.	No. Tested.	1st trial, seconds.	2nd trial, seconds.	Avg.
15	13	40.9	32.7	36.6
16	21	42.5	33.1	37.8
17	26	45.4	35.1	40.2
18	25	36.4	31.2	33.8

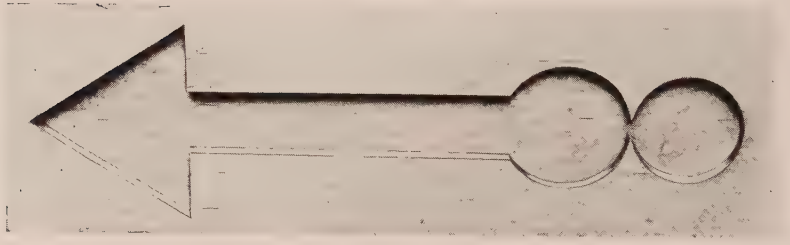
The Arrow-Board used in this test was made of hard wood. The following dimensions are of significance:

Length, 21¼ inches.
Breadth, 7 inches.
Thickness, ¾ inch.
Thickness of blocks, ½ inch.
Diameter of first circle, 3 inches.
Diameter of second circle, 3½ inches.
Breadth of linear groove from circle to arrow head, 1 13/16 inches.

Length of linear groove from circle to arrow head, 9 inches.
Length of blocks 5, 6, 7 and 8, in position, 8⅞ inches.
Length of block 5, 4 x 4¼ inches.
Length of block 6, 4⅞ x 4⅝ inches.
Length of block 7, 1½ x 1½ x 1⅝ inches.
Length of block 8, 3⅛ x 4½ x 3⅛ inches.
Length of blocks 9 and 10, 2⅞ x 3½ x 1⅝ inches.
Arrow head, 5¼ x 5⅝ x 5¼ inches.
Blocks 5, 6 and 7 should fill 8⅞ inches of the 9-inch groove. The remaining ⅛ inch is filled by block No. 8, for which but one solution is thus rendered possible.



ARROW-BOARD BLOCKS



ARROW-BOARD WITH BLOCKS REMOVED

RECORD CARD

NAME AGE
INSIGHT GRADE
COORDINATION
POISE
AMBIDEX. RT. LF.
DESCRIPTION:
1 2 3 4 5 6 7 8 9 10
TIME: 1ST 2ND 3RD AVG.
REMARKS:

References

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5. Witmer, L. Courses in Psychology, etc. *Psy. Clin.,* v. 4, No. 9, 1911, p. 249.
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9. Binet, A., and Simon, Th. Le Dévelopment de L'Intelligence chez les Enfants. *L'Année Psychologique,* Tome 14, 1908.

BOOK NOTES

Reorganization of the public school system. By FRANK FOREST BUNKER. Bureau of Education, Bulletin, 1916, No. 8. 186 pages.

This Bulletin will be of interest chiefly to those interested in present day problems in secondary education. The author describes the rise of the graded school, and shows how the high school came to be the connecting link between the elementary school and college. He then gives an historical account of the agitation that has produced present day reorganization; and describes the first efforts in that direction. This is followed by an exposition of the principles underlying the formulation of a new curriculum for the schools of Berkeley, Cal., and an explanation of how certain difficulties were overcome in putting the plan in operation. Curriculums of other schools are appended. The historical account brings together in an excellent fashion literature from numerous sources; while many of the educational and administrative problems described in connection with Berkeley are common to those found in other places.

Clark University. A. A. DOUGLASS

Girls of the Morning-Glory Camp Fire. By ISABEL HORNIBROOK. Boston, Lothrop, Lee and Shepard Co., 1916. 321 p.

This pleasant little story shows the ennobling effect of the Camp Fire ideals upon growing girls of the most various temperaments and family surroundings. The orphaned and penniless young heroine, who is also one of the higher initiates into the Camp Fire mysteries, by her faithful following of its precepts wins away from their thoughtless selfishness her rich cousins, and becomes the beloved centre of her circle, which is named after the symbol which she has chosen as her own—the morning glory. She has exciting adventures in which a boy scout also figures, saving a drowning deaf child, saving her own self later on from capsizing in a squall, only to become caught in a quicksand, from which both she and the would-be scout rescuer are delivered by the French woodman Toiney. They believe they have found some of Captain Kidd's buried treasure and become transformed into crazed gold-hunters but return to themselves upon failure, and later on the one coin which Glory had found is the medium by which a lawyer seeking for members of her family finds her and enables her to get a small legacy by the aid of which she can complete her education. The symbolism and metaphors which are freely used, to say nothing of the course of the story, should make the book very attractive to budding maidens.

Clark University. AMY E. TANNER

Education and social progress. By ALEXANDER MORGAN. New York, Longmans, Green, 1916. 252 p.

Morgan assumes that we cannot do much to modify the lives of adults who have gone astray but we can do much to help the fifteen million children in the country under fourteen, in whom the whole gamut of human capacity must be represented. Hence the author starts with social pathology, imperfect remedies, causes of social diseases, hereditary, environmental and educational, the conditions of progress, practical education, education and public health, training of defectives, wider use of the school plant, teachers and social progress.

American university progress and college reform relative to school and society. By JAMES H. BAKER. New York, Longmans, Green, 1916. 189 p.

The ten chapters of this book we take it are largely based on the various studies and addresses of the author during the many years he was president of the University of Colorado. Despite his long experience, there are many topics which he touches on which he sheds little light. Indeed, no one could say the latest and best word on the great variety of themes here discussed. The book, however, is very stimulating and it is pervaded by some doubt as to whether the American system meets American needs.

República Oriental del Uruguay; Inspección Nacional de Instrucción Primaria. Memoria correspondiente a los años 1911 *a* 1914, *inclusives, presentada a la Dirección General de Instrucción Primaria y al Ministerio de Instrucción Pública,* por el Doctor ABEL J. PÉREZ, Inspector Nacional. Montevideo, Barreiro, 1915. 570 p.

We have space here only to say that this is one of the most elaborate and interesting reports of primary education ever issued anywhere, and if translated into English it would serve as a model. Instead of dry tables, we are given a large number of curves, many of them in color, a great many photographs that are well chosen, too, of typical matters of interest, and the report impresses us, without having read it exhaustively, as a model and masterpiece of its kind.

Human interest composition subjects. By GEORGE F. PAUL. Syracuse, C. W. Bardeen (c. 1916). 162 p.

This book seeks to furnish subjects for written work in English in secondary schools and also for students who wish to progress without a teacher. They are grouped as themes of every day life, telegrams, letter writing, topic sentences, around the world, school, business, municipal, petitions, themes on country life, modern methods and inventions, themes based on literature, national topics, newspaper life, detailed narratives, tales of adventure, exercises in description. A number of pictures are included and many examples.

Plant anatomy, from the standpoint of the development and functions of the tissues; handbook of micro-technic. By WILLIAM CHASE STEVENS. Philadelphia, P. Blakiston's Son & Co. (c. 1916). 3d ed. rev. and enl. 399 p.

This book is a good index of a growing interest in plant anatomy in schools of America and wherever the English language is spoken. It consists of eighteen chapters, with one hundred and thirty-five cuts. In a book of this character it seems to the writer there should have been to-day more illustrative material, particularly to shed further light on the topics treated in the last forty-six pages of the book.

The principles of health control. By FRANCIS M. WALTERS. Boston, D. C. Heath & Co. (c. 1916). 476 p.

The difference between this volume and the usual books on hygiene is in the emphasis placed on corrective work. It seeks to place before the student the problem of his own physical condition in both its negative and positive phases. The author does not attempt to go into great detail but throughout his twenty-two chapters to be practical. The book is illustrated with nearly one hundred cuts.

The essentials of effective gesture, for students of public speaking. By JOSEPH A. MOSHER. New York, Macmillan, 1916. 188 p.

The author believes that if students can only understand the principles of gesture and the reasons for the expressiveness they give, a very notable improvement will take place. The author expresses indebtedness to Bacon's well known "Manual of Gesture." After the theoretical part of some eighty pages, the rest of the book is devoted to selections.

Oral English; directions and exercises for planning and delivering the common kinds of talks, together with guidance for debating and parliamentary practice. By JOHN M. BREWER. Boston, Ginn (c. 1916). 396 p.

We are told that oral English is taking a place in schools and colleges as a subject independent of both literature and written composition, and that the subject is changing, passing from practice in imitation of masterpieces to direct effective speaking with little adornment, so some of the author's chapters are entitled Simple Business Talks, Explanations, Speeches for Special Occasions, Narration, Description, Vocabulary, etc.

Report of the Commissioner of Education for the year ended June 30, 1915. Volume I. Washington, Govt. Printing Office, 1915. 780 p.

This report follows in the main the traditional rubrics, surveying education in different countries, particularly the countries not most interesting, such as France and Germany. One brief chapter is devoted to significant events in the countries of Western and Central Europe, and another, which is no less inadequate, devotes eight pages to education in Southern and Southwestern Europe.

Publications of the Survey Committee of the Cleveland Foundation, Cleveland, Ohio, 1916.

Boys and girls in commercial work. By BERTHA M. STEVENS. 181 p.
Schools and classes for exceptional children. By DAVID MITCHELL. 122 p.
Measuring the work of the public schools. By CHARLES HUBBARD JUDD. 290 p.
Department store occupations. By IRIS PROUTY O'LEARY. 127 p.
The building trades. By FRANK L. SHAW. 107 p.
Railroad and street transportation. By RALPH D. FLEMING. 76 p.

These further publications of this survey are fully up in interest and in value to those that have appeared earlier.

Digest of state laws relating to public education, in force January 1, 1915. Compiled by WILLIAM R. HOOD, with the assistance of Stephen B. Weeks and A. Sidney Ford. Department of the Interior, Bureau of Education, Bulletin, 1915, No. 47. Washington, Govt. Printing Office, 1916. 987 p.

The Young and Field literary readers. Book Two. By ELLA FLAGG YOUNG and WALTER TAYLOR FIELD. Boston, Ginn (c. 1916). 208 p.

The British Isles. Cambridge geographical readers, III. Cambridge, University Press, 1915. 210 p.

Solid geometry. By WILLIAM BETZ and HARRISON E. WEBB. With the editorial coöperation of Percey F. Smith. Boston, Ginn (c. 1916). 504 p.

Present day geography. By Mrs. R. E. BROWN. Syracuse, C. W. Bardeen (c. 1916). 68 p.

America the wonderland; a patriotic festival. New York, Ethical Culture School (c. 1915). 55 p.

The Germania of Tacitus. Edited by Duane Reed Stuart. New York, Macmillan, 1916. 139 p.

National Education Association yearbook and list of active members, revised to December 31, 1915. N. E. A. Bulletin, Feb., 1916, vol. 4, no. 4. 375 p.

National Education Association of the United States. Journal of proceedings and addresses of the fifty-third annual meeting and international congress on education held at Oakland, California, August 16-27, 1915. Secretary office, Ann Arbor, Mich., published by the Association, 1915. 1193 p.